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The Tool Engineer

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ERICAN SOCIETY OF TOOL ENGINEERS

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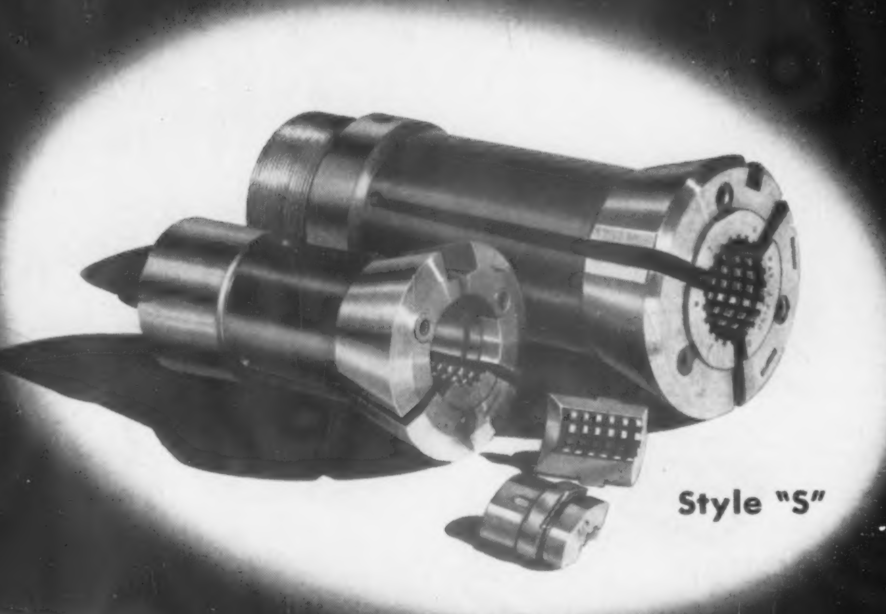

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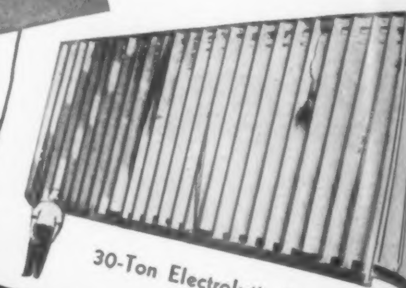

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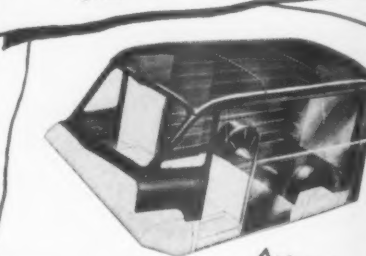

Automotive Products

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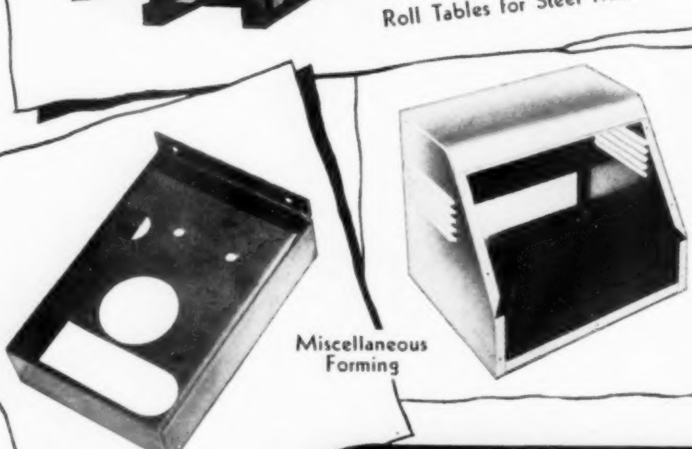

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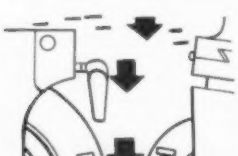

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Standard No. 0 Rigidmil with 2 magnetic fixtures. Part is rough milled on one side in first fixture and transposed to 2nd fixture for milling opposite side. Production is approximately 170 pieces per hour.

Sundstrand No. 1 Rigidmil with a special 2 spindle head. Two right angle surfaces machined on cast iron compressor part at production rate of approximately 150 pieces per hour. Use of automatic index base makes it possible to load at one station while milling at opposite station.

Standard No. 1 Rigidmil with special 3 spindle head for milling 3 sides of a cast iron compressor part. Machine has two work-holding fixtures mounted on an automatic index base. Three sides of part machined in each machine cycle at rate of 172 pieces per hour.

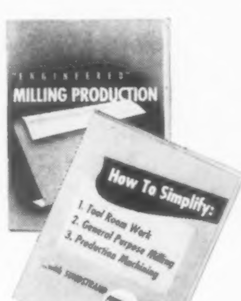
2 PRODUCTION MILLING

Here's and entirely different approach to a milling problem. Production requirements on these refrigerator compressor parts are over 100 per hour. Consequently, the Sundstrand Rigidmils are tooled up with special fixtures and, in some cases, with special milling heads. Production milling prolem solutions like these are the result of Sundstrand "Engineered Production". This service consists of designing the most profitable processing method first, then obtaining machines to suit this method . . . standard or semi-standard machines, if possible, or entirely special machines, if necessary. The machines illustrated on this page are all standard or semi-standard Rigidmils tooled up for special production.

Standard No. 1 Rigidmil with special three spindle head for milling three sides of a cast iron compressor cylinder head. Machine has two work-holding fixtures mounted on an automatic index base. One part is machined with each cycle of the table at a production rate of 145 pieces per hour.

Get this **FREE** Additional Data

For complete information on Sundstrand "Engineered Production" including specific tooling and production data, write for Bulletin No. 703. For more information on Sundstrand Magnetic Fixtures, ask for Bulletin No. 703M.



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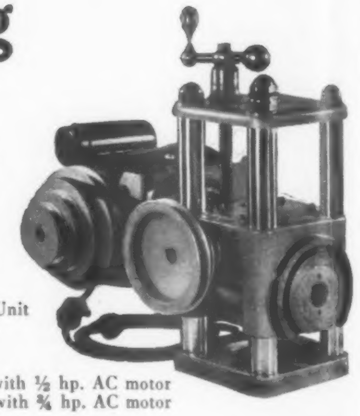

Versa-Mil Power Unit
6" travel on posts
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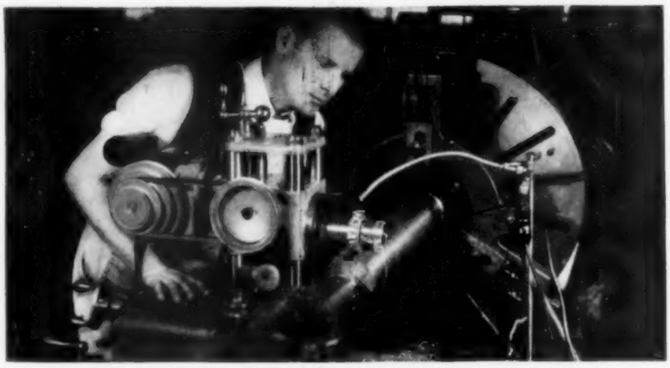
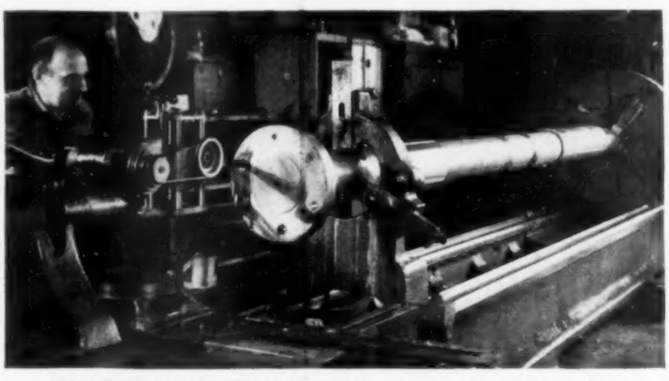
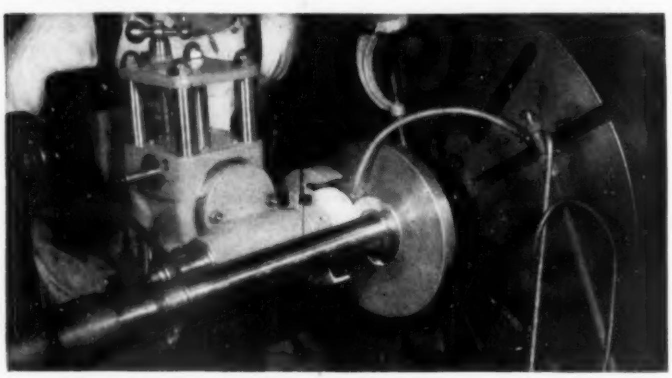
6" x 6¼" base
Weight: 89 lbs. with ½ hp. AC motor
104 lbs. with ¾ hp. AC motor



MILLING KEYWAY: Milling ¾" x ⅜" keyway in cold rolled shafting at rate of 1" per min. 3" cutter at 98 rpm. 30" swing lathe, ½ hp. motor



OFF CENTER BORING AND DRILLING: Complete machining of coupling flange of propeller tail shaft without removing work from the lathe. Time saved—65%



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This job of drilling eighty 9/32" holes in a flange ring of stainless S-155 would, by "conventional" methods, require a six foot radial drill press. In the tooling budget, $45,000 was allocated for the entire job.

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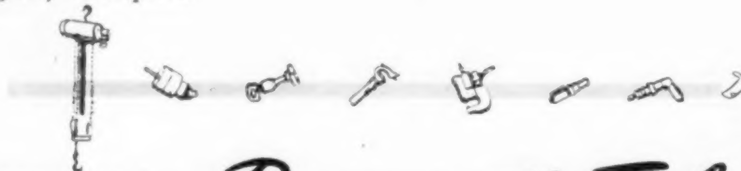

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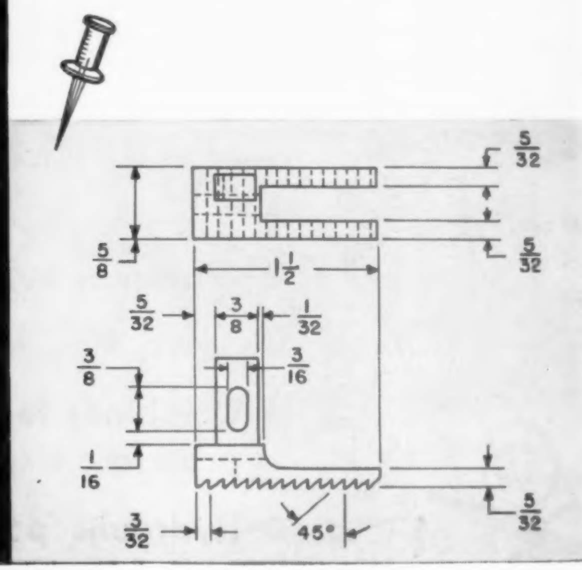

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The booklet, "Investment Castings," gives tips in designing parts to be produced by the HAYNES investment-casting process. Call or write the nearest district office for a copy.

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The Tool Engineer

a Letter from the Editor...

New Year's Day at the editor's office was about the three-quarters stage of the birth of the new *Tool Engineer.* That afternoon we finalized printing orders on the format changes and new features that have been in the planning and development stages at *The Tool Engineer* offices for some months.

I'd like to get into the background of the many changes you've noticed in this month's *Tool Engineer,* because they represent a custom job tailored to your, the reader's requirements, by the editorial and production staffs of your magazine.

Since the lifeblood of any magazine is the interest with which it is received by its readers, the beginning of our efforts many months back was to determine how we could simultaneously make *The Tool Engineer* both easier to read and at the same time more helpful to ASTE members—no little accomplishment, I hasten to point out, since our staff's efforts in the past have been rewarded with an enviable response on the part of our 18,000-odd readers.

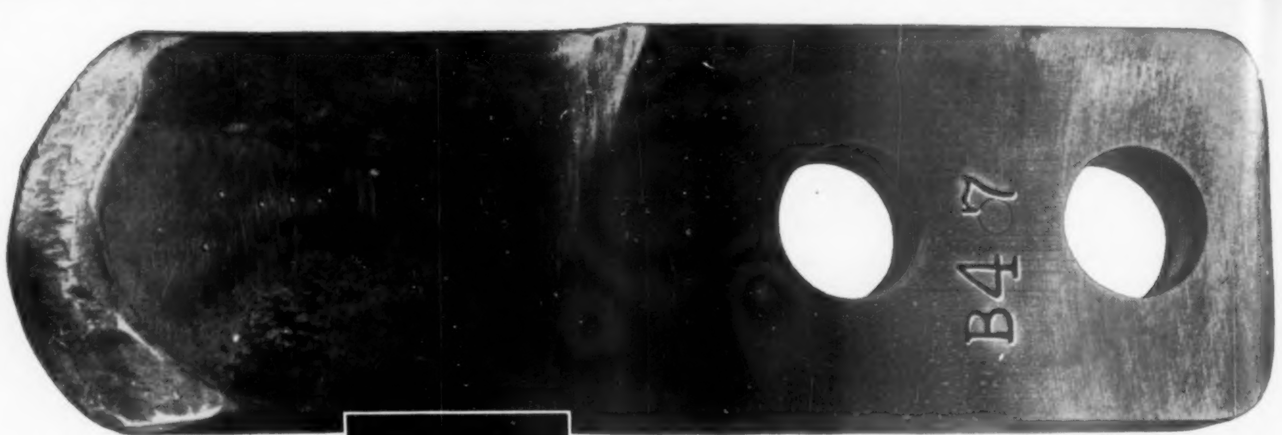
An important part of these studies was the accumulation of data based on our talks and interviews with ASTE members, to analyze specific needs of individual readers with respect to type of tool engineering material, editorial treatment and manner of presentation. Our basic guide here was simple in nature: we felt that a re-evaluation of our editorial program would bring to light changes which would make *The Tool Engineer* even more indispensable to the tool engineering profession.

Skipping over the several months of staff meetings and study, the new feature you probably noticed first was our photographic cover. With a second look you'll note that the cover illustration ties in our first Tool Engineering Report—a feature designed to bring you in alternate issues a thorough treatment of the latest in tool engineering techniques. A companion feature to this report is Tool Engineering in Action, which brings you a tool engineer's view of the best in tool engineering practice in the United States and Canada.

Science has come into *The Tool Engineer* planning with the adoption of new types and new layout to make reading easier and pack more comprehension into your reading hours. Some of these improvements are subtle but powerful, and we'd appreciate your comments.

Next month I'd like to take you behind the scenes once again. Meanwhile, happiness to you throughout 1951 from all of us.

Gilbert P. Muir



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SOME TYPICAL EXAMPLES

B-47 dummy blocks, vs. 9% and 12% tungsten types, extruded more than twice as many brass and copper tubes. B-47 dies outperformed 12% tungsten type 1½ to 1.

B-47 punches, vs. low-carbon 18-4-1 type, hot pierced more than twice as many eyes in steel axes. See top picture.

B-47 die inserts, vs. 9% tungsten types, hot pressed more than twice as many steel side gear forgings. B-47 die inserts, vs. regular insert material, performed better than 5 to 1.

B-47 dummy blocks, vs. 5% tungsten-5% chromium types, extruded twice as many copper and brass tubes and rods. B-47 dies outperformed 12% tungsten-12% chromium type.

B-47 punches, vs. 5% chromium type, hot extrusion forged 1½ times as many automotive steel front axle spindles.

B-47 die inserts, vs. 9% tungsten types, extruded 1½ times as many high alloy steel automotive valves. This is considered a very difficult job for any grade of hot work steel.

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The Tool Engineer

Editorial

Evolution and Growth

WITH THIS issue *The Tool Engineer* completes another phase of its development under ASTE's complete program for strengthening of all Society technical activities.

Although the many changes you will note in this issue are editorial in nature, we feel that their effects will be far-reaching in that they will form a major part of our efforts to continually improve *The Tool Engineer* as a major technical publication.

These changes are important for ASTE because *The Tool Engineer* is one of ASTE's most important activities. Besides providing for all our members a balanced program of the latest in tool engineering methods, it serves as a major link among all of us.

Thus our development work, carried out under the direction of our editor, has been aimed at providing even more complete coverage of technical information for our readers, and in addition making the magazine easier to read.

You will note in this issue many typographical changes. Some of these to us readers will not be too obvious; but they are scientifically calculated to increase our reading enjoyment as well as our ease of reading.

You will note many new features which begin with this issue. The first of a new series of Tool Engineering Reports is one of these. This will provide, in easy-to-clip-out-and-file form, a complete manual six times a year on important phases of tool engineering. Another special report will be unveiled in our February issue—it will be a newcomer not only to *The Tool Engineer* but also to technical publishing in general.

Other new features, such as the editor's letter and a much more complete contents page just inside the front cover, are designed to take you behind the scenes of *The Tool Engineer* and make it easier for you to locate those articles and features which can help you professionally.

In conclusion, we're proud of the new appearance of *The Tool Engineer*, and we believe you will be also when you've completed your examination. It would also aid our planning greatly if you'd drop us a line on your reactions, pro or con, to these improvements in our magazine.

H. L. Tigges

PRESIDENT
1950-1951

Coordinate Design and Measurement

By Douglass Hawks, Jr.
METROLOGIST
HAMILTON WATCH COMPANY

THE PRINCIPAL PROBLEM encountered in the production of high grade watches is not the remarkably small size of some parts, as is commonly assumed, but rather the great number and complexity of dimensions which must be machined to extremely close tolerances. This has led the watch industry to pioneer in the development of methods and equipment for accurately controlling locational and profile dimensions.

The first requirement for handling such cases is to prepare a detail drawing in which the location dimensions are laid out according to the Cartesian coordinate system, as illustrated in Fig. 1. Under this design system, dimension lines are not drawn to individual points. Instead, each point is merely identified by a number and a table which lists the dimensions and tolerances pertinent in each case is included on the drawing. The dimensions given in the table all refer to the perpendicular distances from each point to two basic reference lines—one vertical and the other horizontal. Specifying the vertical and horizontal distances of each point from the basic position, identifies the location.

Fig. 1 shows how the coordinate dimensioning system may be applied to define outside shape, profiling (recesses on under side) and location of holes. Several sheets of intricate detailing would be required to convey this much information by conventional dimensioning methods.

In this illustration, the reference lines (coordinate axes) are the horizontal line drawn through the centers of pins numbers 1 and 2, and the vertical line drawn perpendicular to this through pin number 1. Thus pin number 1 is the effective center of the axes with pin number 2 serving to establish their angular position. Pin number 1 is identified by the coordinates 2, 2 instead of 0, 0, as would be applied to the true center of a Cartesian system.

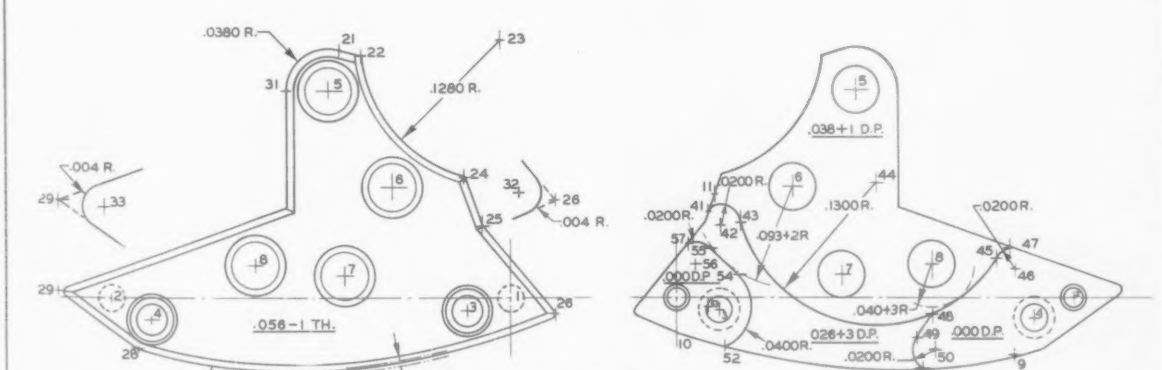


Fig. 1. This drawing of a watch part illustrates the application of Cartesian coordinate dimensioning to define three properties of the part. Over 80 pairs of dimension and extension lines would be needed to show a similar amount of information on an ordinary drawing.

This is done in order to avoid confusing operators with negative numbers for locations to the left of and below the center.

Among the principal advantages of the coordinate method, from the point of view of the designer, are that it eliminates the confusion caused by placing a great number of dimension and extension lines on one drawing or series of drawings; it simplifies product design computations, particularly where several complicated components are to be assembled; and it facilitates the design of jigs and fixtures, since these items can easily be laid out using the same coordinates employed in the product design.

Unification and ease of interpretation of specifications are the primary advantages for process engineers and tool manufacturing staff.

For the inspector and the executive who are to evaluate the quality of the products, this system simplifies the process of finding, recording, and analyzing errors, as well as eliminating the effects of cumulative tolerances (condition in which the actual variation in the position of a surface is dependent upon the sum of tolerances on two or more other dimensions, with resultant confusion as to the acceptability of the part involved).

Coordinate Measuring Machine

Coordinate specifications will not by themselves bring all of the advantages listed above; the system will not become fully effective without machine tools and measuring instruments designed to complement the plan.

The Hamilton Watch Company designed and built its own measuring instrument, the Coordinate Measuring Machine, in order to have an accurate and practical means for inspecting dimensions of this type (see Fig. 2). This instrument is similar to a toolmaker's microscope except that it is more accurate, has greater range of measurement, is more durable and has a greater variety of applications.

The work to be inspected is viewed through a 32X microscope having an oblique ocular inclined to 60 deg for operator convenience. The microscope reticle includes forty-five concentric circles for rapid centering of pins and holes, as well as the conventional vertical and horizontal reference lines.

Uses Lead Screw Principle

Measurements are taken by means of two precision-ground lead screws, each having a range of four inches. The micrometer drums attached to the screws are graduated in units of 0.0001 in., with verniers reading directly in units of 0.00002 in. The action of the lead screws is controlled by correction templates which are filed to compensate for slight lead errors in the screws themselves.

The lead screw principle has proved to be preferable to the master scale principle sometimes employed on measuring microscopes because slight errors, always present in either a scale or a lead screw, can be compensated. In addition, the lead screw instrument requires the operator to read only one microscope instead of three, thus reducing observational errors and greatly shortening the time required for taking readings.

Another feature of the machine, not commonly found on microscope instruments, is that the slides for the microscope head are scraped very accurately perpendicular to the work table and are closely fitted. This makes it possible to inspect surfaces of

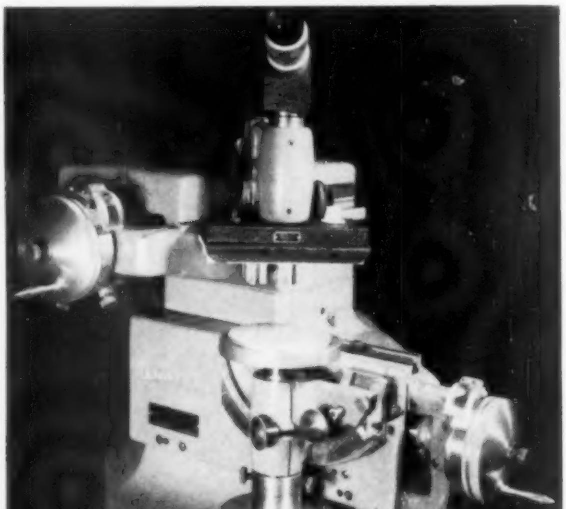


Fig. 2. This coordinate measuring machine makes it possible to inspect work directly in terms of coordinate dimensions.

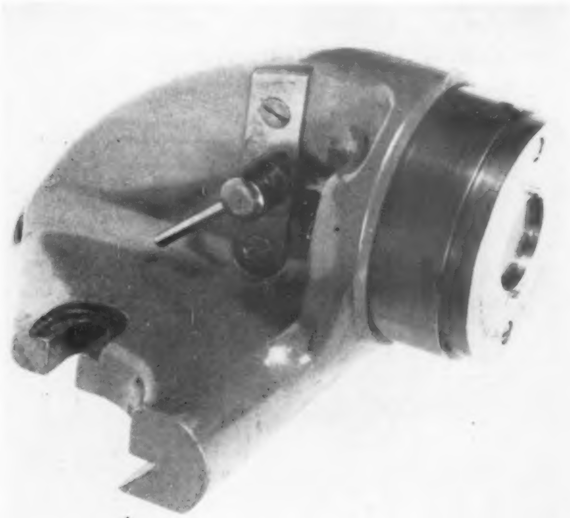


Fig. 3. Inspection chucks of this style position work automatically, eliminating alignment by observation.

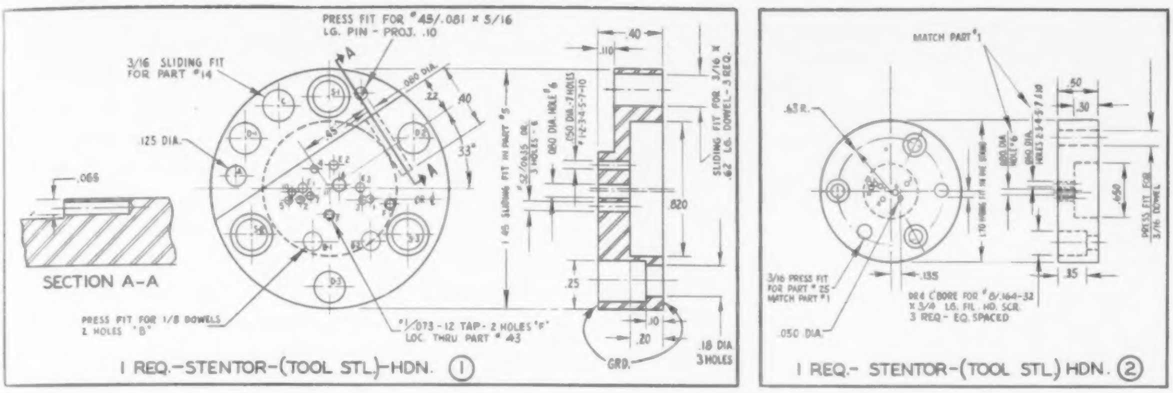


Fig. 4. This portion of an actual die design shows how coordinate dimensions are used to denote location of precision holes. Coordinates are same as those given for corresponding holes on the watch design, and dimensions are included on die drawing with reference keys.

various heights by changing focus during measurement without affecting the accuracy of results.

One of the greatest advantages of the coordinate measuring machine is that the workpieces produced in large quantities can be positioned without any individual setup so as to read directly in values corresponding to the coordinate dimensions as given on the drawing. For example, the point with coordinates listed as 2.0000, 1.0000 on the drawing will read 2.0000, 1.0000 on the measuring machine if the part has been made exactly right. Any difference between the drawing specification and the machine reading directly represents the amount of error in the part. A large saving in operator time, as well as greatly improved dependability have resulted from this arrangement.

Special Chucks Designed

Alignment of the work in the machine is accomplished by the use of special chucks which have locating pins for positioning each successive workpiece in the same spot as it is mounted on the machine for inspection. To make this arrangement effective, the locating pins of the chuck must fit directly into holes which are basic reference points for the dimensioning of the workpiece. In addition, the work must be produced in sufficient quantity to require repetitive inspection.

The inspection chucks (see Fig. 3) are constructed so as to be used interchangeably on any of the coordinate measuring machines. The mounting surface of the machine is an accurately scraped Vee-way, which mates with a corresponding inverted Vee surface on the chuck. This assures that the axes of the chuck will be accurately in line with the measuring axes of the machine, a necessary condition for obtaining automatic alignment of workpieces.

When a chuck is first set up on the machine, the microscope is located on a "spot" (a distinctive depression marked in the exact geometric center of the chuck-plate). The scale-indicating pointers and the micrometer drums, which are adjustable with respect to the lead screws, are unlocked and set to give readings of 2.000, 2.000 at this point. This is the center of the range for the two lead screws with 4 in. travel. The chuck plates have previously been laid out in the coordinate system with the spotted point taken to be 2.0000, 2.0000, the center of the coordinate axes. The locating means on the chuck plates are dimensioned to correspond to the mating features of the watch parts.

In this way, the coordiate dimensions on the watch part, the dimensions on the locating chuck and the readings of the coordinate measuring machines are made to agree. To set up the measuring machines for any job, it is necessary only to mount the appropriate chuck and adjust the micrometer settings to give the proper readings at the spotting point. Successive workpieces are then placed on the chuck and positioned for direct measurements merely by fitting them over the pins or other locating means on the chuck.

High-Speed Location

The actual inspection of watch parts has proved the remarkable speed with which this operation may be performed. Hamilton time study figures show that twenty-three precision holes can be accurately checked for location, including mounting the work and recording the exact amounts of the errors, in seventeen minutes. This represents a tremendous time saving over the conventional surface plate and height gage method of precision location inspection; the latter would require at least five hours to do the same job to a corresponding degree of accuracy.

When jigs, fixtures, special watch parts or other items produced in small quantity are to be checked, it is not practical to procure special locating chucks, of course. For such cases the coordinate measuring mahine is employed as a laboratory instrument. A universal measuring table is used and the work is made parallel to the measuring axes by rotating the table with the work under observation in the

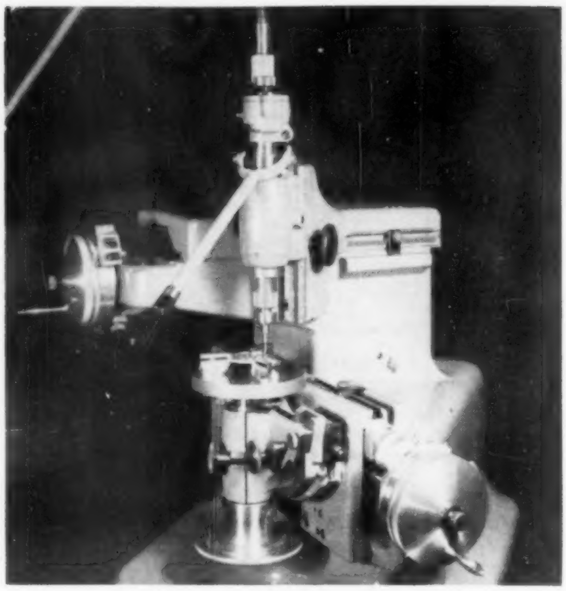


Fig. 5. Coordinate measuring machine used as jig borer. Interchange of microscope and drill spindle eases location.

microscope. The micrometer drums are then adjusted to read directly in the coordinate dimensioning system as before. From this point, each piece may be checked as rapidly as the mass-produced items and the complete operation is still more efficient than conventional measuring methods.

Using Measuring Table

The universal measuring table is designed to permit the greatest possible variety of laboratory measurements. The plate may be indexed in the horizontal plane from 0 to 360 deg with vernier readings in units of 2 min. The plate may also be tilted in the vertical plane from 5 deg to 105 deg with the index vernier again reading in units of 2 min. This makes it possible to measure almost all types of angles and to take linear measurements on surfaces which form compound angles with one another.

The table tilt device is also used when it is desired to take additional linear measurements at right angles or at odd angles with respect to original measurements without disturbing the setup, as well as for checking the squareness of pins and similar protruding surfaces.

Further use for the universal measuring table is found in the inspection of dies, jigs, fixtures and gages. Whenever the tools are to be used for the production of parts dimensioned according to the coordinate system, the tool design drawings are preferably laid out in coordinates in order to realize the many advantages previously explained. This is illustrated in Fig. 4, showing the design specifications for the precision locations on a die to be used in shaving the holes on a barrel bridge. However, when individual tools happen to be laid out with conventional dimensions, they can still be checked on the coordinate measuring machine with much greater speed than would be obtained by surface plate methods. Measurements are taken merely by noting the differences in readings between points in question, according to the methods usually employed in the operation of ordinary toolmakers' microscopes.

The actual manufacture of jigs and fixtures is also accomplished according to the coordinate system through the measuring machine. This is done by converting the instrument to a machine tool; a change-over which may be effected in a few seconds.

The instrument is set up for spotting operations by sliding the microscope out of its holder and substituting a punch. This punch is the same diameter as the microscope tube and the point is accurately concentric with the diameter. This means that any location which has been centered in the microscope will fall directly under the punch.

The method generally used for spotting is to locate the reference surfaces on the work with the microscope, set the micrometer drums to the appropriate coordinate readings and move the measuring head until the micrometers show the reading specified for the point to be spotted. The punch is then substituted for the microscope and the gear rack and pinion ordinarily used to focus the microscope are used to bring the punch down and mark the work with a "spot." These spots are later used, of course, to locate drills for drilling precision holes at the desired locations.

When utmost accuracy is desired for location of holes, the measuring machine can also be used as a jig borer. To make this change, a drill spindle assembly with a diameter the same as that of the microscope tube is exchanged for the microscope and the procedure is similar to that employed for spotting. This arrangement is shown in Fig. 5. Power from an electric motor is supplied to the drill spindle through the flexible cable.

This arrangement, like that for spotting, utilizes the interchange of microscope and tool to locate from any desired reference surfaces at high accuracy, in addition to providing a very speedy and precise jig borer for ordinary types of applications.

Reference:

"Cartesian—Coordinate Dimensioning for Precision Components" by B. L. Hummel.

Product Engineering, Vol. 21, No. 4, April, 1950, pages 124-129.

"Simplified Dimensioning System" by N. W. Taylor.

Machine Design, Vol. 20, No. 2, February, 1948, pages 135-137.

Pneumatic Deflashing Jig Speeds Core Flash Removal

By John Starr

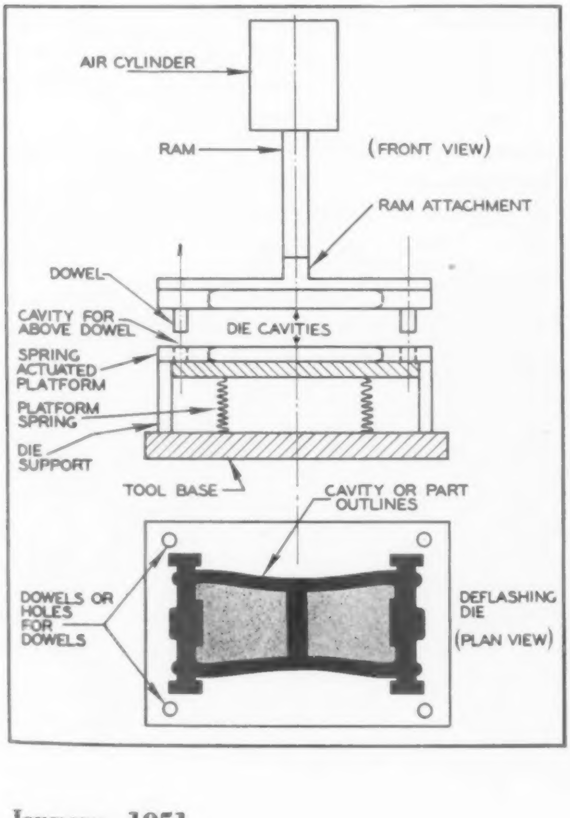
Cores for sand-casting both ferrous and non-ferrous alloys are often difficult to fabricate because the resin-bound sands therein must be molded over wires or other metallic reinforcements, and because flash on the cores is normally removed with manual tools—causing many cores to be damaged so that they cannot be used, or improperly prepared for use.

Therefore, officials of G-B Brass & Aluminum Foundry at Los Angeles maintain they are now getting better production at a 25 percent lower cost through the use of a new-type jig for the removal of core flash. In addition to minimizing the need for core reinforcements, this jig is said to reduce core damage to negligible proportions while permitting one tool operator to accomplish deflashing work that previously required five employees.

Purpose of the jig is to remove core flash with mated die blanks, which are similar to the tools used in blanking sheet metals, and it can be equipped with virtually all of the types of dies that might be needed to blank or trim cores with varied design characteristics.

Each of the mating dies is a steel plate in which the profile or blank outlines of a core are perforated. One die is horizontally mounted in an overhead position, so that it can be moved up or down with the ram of an air cylinder, while its mate is horizontally mounted in a stationary position over a spring-actuated platform.

Cores are respectively loaded in the cavity formed by the lower die and the spring-actuated platform. No pressure is exerted on a core as the upper die penetrate orifices in the lower die so that the core-supporting platform is pressed downward. Spring supports return the platform and its core to the original loading position when the dies are opened.



Operation of the deflashing jig is shown schematically at left, along with the deflashing die. Below, the set-up is seen in use (trimmed part is in foreground).

Trouble Shooting

Some Precision Grinding Problems

By L. P. Tarasov
NORTON COMPANY RESEARCH LABORATORIES
PRESIDENT

THE GENERATION OF excessive amounts of heat in grinding, sufficient to burn or crack the surface of hardened steel, is responsible for a considerable portion of trouble shooting. Much of the difficulty can be traced to a variety of grinding errors, such as those to be described.

Case 1—The cracking of *hardened* steel oil field pump liners when they were internally ground was found to be caused by the use of wheels that were too hard for the job. Severe burn marks in some of the liners furnished the clue. It turned out that the same wheels had been used successfully in the past for grinding *soft* steel liners, and since a large number of these wheels were still on hand, the management wanted to use them up. However, the hard wheels glazed so rapidly on the hardened liners that it was necessary to replace them with another specification in a softer grade.

Case 2—The use of too hard a wheel was found to be the reason that some of the case-hardened compressor shafts produced in another plant galled and seized when placed in service. When a sample shaft was etched successively in dilute solution of nitric acid in water and then of hydrochloric acid in acetone to bring out evidence of grinding burn (as described in detail in the previous article),* portions of the surface in the critical area became very dark. Such darkening is associated with softening of hardened steel by the overtempering action of excessive grinding heat. Microhardness studies showed that the surface hardness was equivalent only to Rockwell C52 in these soft regions instead of C62 as it should have been. The galling experienced in service was caused by the soft spots, which were extremely shallow, well under a thousandth of an inch. Observation of the grinding operation led to the discovery that the grinding wheels used in producing the defective shafts were much too hard. Here the tool crib was at fault in furnishing the operators with such hard wheels instead of the much softer ones that were supposed to be used for the job.

Case 3—The hardened steel bushing, a portion of which is shown in Fig. 1a, cracked during internal grinding. The cracks were made clearly visible by the Magnaflux method. To convince the grinding foreman that these were not heat treating cracks, the piece was etched so as to bring out the severe burn streaks shown in Fig. 1b, where they can be seen to correspond exactly to the rows of cracks. In instances like this, where only a portion of the ground surface is burned and cracked, the trouble may be due to poor positioning of the work in the chuck, so that part of the cut is much deeper than expected. The same result may occur when high spots caused by poor machining or by heat treat distortion are present in the work, as will be discussed later.

Case 4—The die in Fig. 2 was found to be badly cracked after it was ground, but there was no sign of any discoloration from excessive grinding

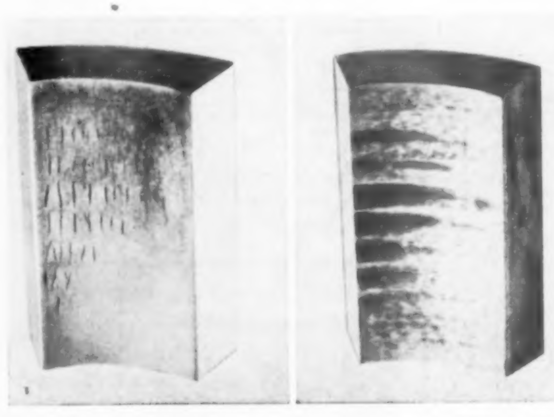


Fig. 1a (left) shows portion of hardened bushing cracked during grinding. Etching (Fig. 1b, right) brought out burn streaks.

*"A Metallurgical Approach to Grinding Hardened Steel," September, 1950, p. 24.

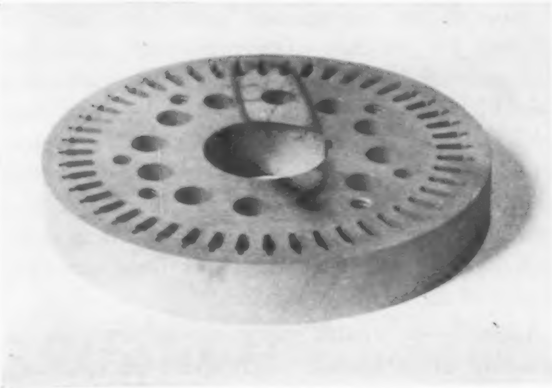


Fig. 2. Etching this part brought out oval section shown, which indicated severe heat and burning during grinding.

heat. Because the cracks were clearly associated with the holes in the die and bore no relation to the grain marks left by the wheel, it first appeared that the die had cracked during heat treatment and that grinding had nothing to do with the cracks. However, etching the die revealed that it had been burned very badly in just the region of the cracks, as can be seen in Fig. 2. The nearly oval, light-etching area was quickly brought to a high enough temperature by the heat of grinding that it hardened completely upon being quenched by the cold steel underneath the burned region. Surrounding this light-etching area is a very narrow dark boundary of overtempered steel, where the heat was sufficient to soften the hardened and tempered die but not to reharden it. The rest of the die, etching a neutral gray, was not affected by grinding heat.

Thus the burn pattern made it possible to reconstruct just what had happened to the die. At some time in the grinding operation, the operator had brought the wheel down upon the work while it happened to be stationary, and had thus burned and cracked the work in the whole area that was briefly in contact with the wheel. Thereupon, the operator proceeded to conceal his mistake by grinding the surface in the normal way until the gouged-out portion was completely removed and there was no trace of surface discoloration. However, the damage to the underlying metal still remained and this was easily made visible by etching.

Ordinarily, high grinding temperatures do not penetrate more than a few thousandths and if cracks form, they do so in a pattern related to the grain marks. In the present instance the work was stationary and the heat penetrated many times more deeply, as can be seen from the depth of the light-etching area in the central hole of the die. The grinding wheel, rubbing against the stationary work, generated heat just as though an extremely intense flame was directed against the steel surface. In other words, the wheel acted primarily as a very concentrated and powerful heat treating device and the die cracked accordingly.

From the examples cited thus far, it can be seen that the generation of exessive grinding heat in hardened steel through faulty grinding practice results in metallurgical and hardness changes in the surface layers of the steel which can be readily detected by a suitable etching technique. The removal of the surface discoloration generally associated with grinding burn does not destroy the possibilitity of proving that grinding heat was excessive, unless the whole layer that was affected by the heat has been carefully ground off.

High Spots

Other factors besides faulty grinding practice can result in excessive grinding heat. High spots on the work, whether caused by prior machining operations or by distortion in heat treatment, can lead to unexpectedly heavy cuts unless the work has been carefully indicated. This can be done in toolroom grinding, for instance, but it is not economically feasible for most production grinding. Excess stock is often overlooked as the cause of the severe burn and the grinding operation gets the blame.

Case 5—An example of this type of trouble is furnished by carburized and hardened worms, about 1 inch in diameter, many of which were found to have shallow cracks in the roots after the threads had been ground. It turned out that the cracked ones were burned badly, as shown in Fig. 3 by a portion of such a worm in the etched condition, while those that did not crack were not burned. Further investigation revealed that the burned and cracked worms were the ones that had been left considerably oversize in the hobbing operation preceding heat treatment. The real source of the difficulty was the poor condition of the hobbing equipment. Until this was replaced by equipment capable of machining to the required tolerance, it was necessary to add an extra grinding operation

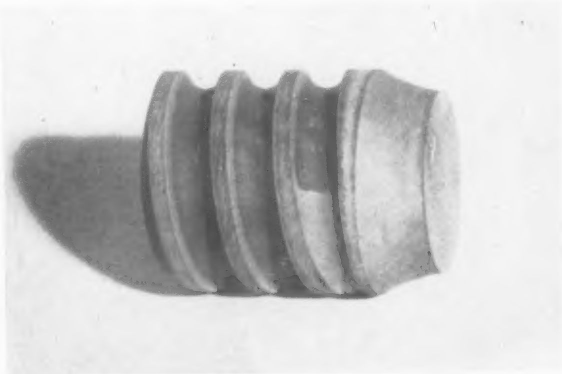


Fig. 3. An extra grinding operation here caused burning, as indicated by the partially etched section.

directly after hobbing, when the steel was still soft, so as to avoid removing too much stock when grinding the hardened threads.

Grinding Sensitivity

When hardened steel happens to be sensitive for one reason or another, it may readily crack even though it is ground carefully and very little heat is generated in the process. Sometimes it is impossible to detect any evidence of overtempering in such a surface by the most sensitive etching techniques available, and even when some burn can be detected, it may be too slight to be significant.

Carburized steels are by far the most troublesome from the standpoint of sensitivity. The source of the sensitivity is brittle iron carbide that is likely to form around the individual grains of the steel in the very outer porton of the carburized layer if the carbon content there is sufficiently high. This network may be only a thousandth deep but this may be enough for cracks to start. As a result, metallographic examination of the surface after it has been ground will frequently not reveal any network. To get around this, it is necessary to examine an adjacent portion of the carburized surface which has not been ground, if this is available, or else to examine an unground part that has been carburized at the same time.

Case 6—The great practical importance of the carbide network in making carburized steel highly sensitive is well illustrated by the following example. A commercial grinding shop had a contract to grind a large number of small bevel gears on the hub surface. One lot they were unable to grind without cracking unless the grinding was done so gently that they lost money on every gear. Another lot could be ground at normal production rates without any fear of cracking. Metallographic examination of an underground gear from each lot showed the presence of a pronounced iron carbide network in the outer portion of the carburized case of the gear from the sensitive lot (Fig. 4a), while the gear from the lot that could be ground without difficulty was completely free from this network (Fig. 4b). No further trouble was experienced when the carburizing practice was modified slightly to prevent the network from appearing in any of the lots.

Case 7—A similar experience occurred in the grinding of carburized shuffleboard pucks. Until attention was paid to the carburizing procedure, even very soft wheels were liable to crack the pucks and it was necessary to decrease the rate of production considerably in order to get a satisfactory percentage of acceptable pieces. When the carbide network responsible for the sensitivity of the steel was eliminated by a change in the carburizing practice, it became possible to raise the grinding production rate to almost four times what it had previously been; moreover, wheels previously put aside as too hard were now used up without causing any difficulty from cracking.

Case 8—Sometimes a particular lot of steel is extremely sensitive even though it has been properly heat treated, to the best of present knowledge, and nothing suspicious can be found in the mircrostructure. This can happen both in direct hardening steels, like SAE 52100, and in the carburizing grades. For example, occasional lots of carburized splined shafts were found to be extremely difficult to grind without cracking while most lots would not crack under far more severe grinding conditions. Careful studies showed that the cracking, when it did occur, could not be attributed to varia-

(Continued on page 41)

The significance of the carbide network in toolsteel is illustrated by Fig. 4a (left) taken from a highly sensitive lot which gave trouble during grinding.

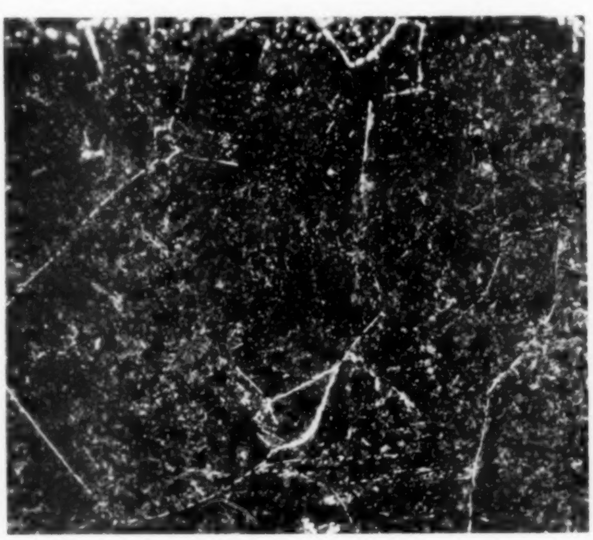
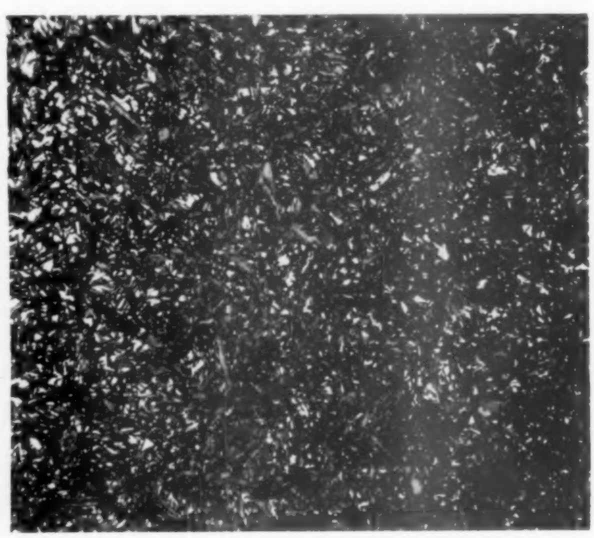
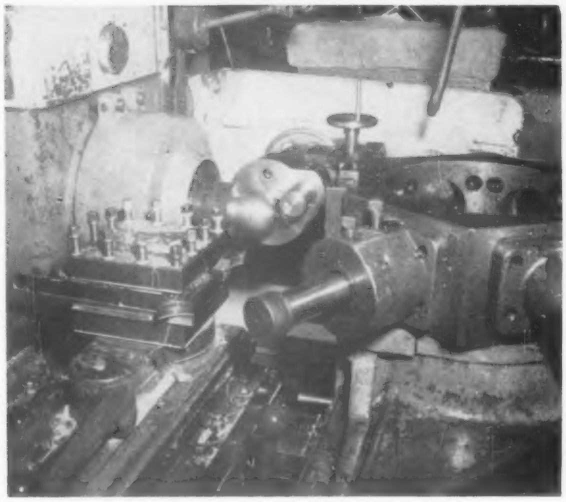


Fig. 4b (right) was taken from a trouble-free lot of the shipment, and shows no network. Carburizing change removed difficulty.



Sphere Turning for Small and Medium Production Runs

By H. G. Frommer



THE TOOLING PROBLEM described here involved a 200-piece production run of the part shown in Fig. 1. Made of 0.40 carbon cold-rolled steel, the part was ultimately produced as explained in Figs. 2, 3 and 4.

The machine available for the job was a No. 2L Gisholt turret lathe, equipped with a $3\frac{1}{2}$ in. collet. A further requirement on the tooling was that it must be usable for other spheres of similar dimensions.

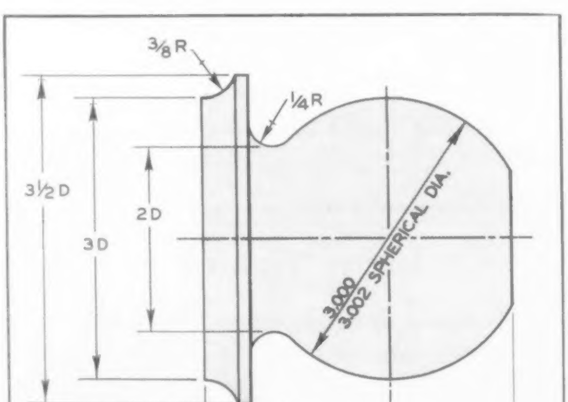


FIG. 1

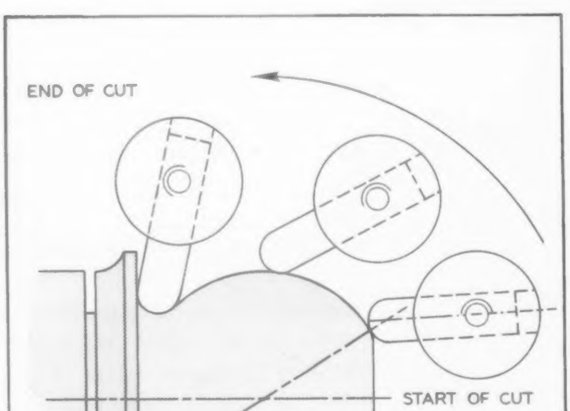


FIG. 2

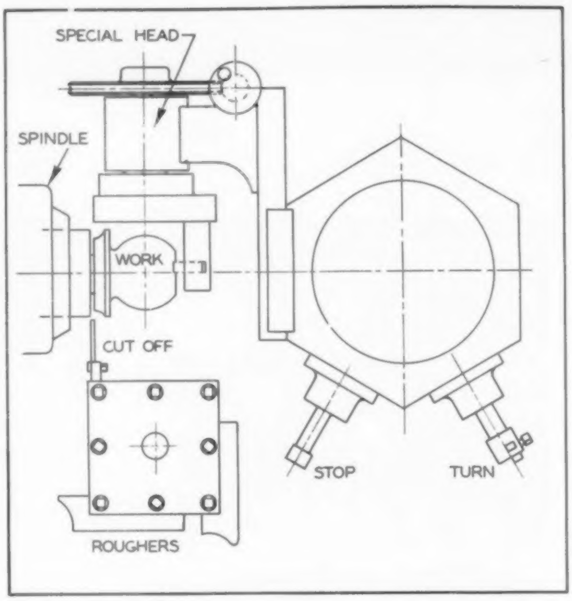


FIG. 3

After consideration of all factors it was decided to use form cutters for roughing only and to generate the sphere with a light finish cut. For the latter, a special head was designed which consisted of the body, bearing-equipped spindle, holder disk and worm drive. As shown, the radius tool is rotated over the top of the workpiece until its radius blends with the 3/8 in. radius. The tool, which is fastened in a toolholder, can be set up to utilize either rotation of the turret lathe spindle. However, to give the operator a better view of the cutting operation, the tool was adjusted for reverse rotation. The toolholder is clamped into the holder disk, which in turn in fastened to the adaptor spindle. The holder disk can be replaced, if desired, by a variety of disks to suit each particular job, or it can be built with dovetails and micrometer adjustment. In any case, it should be provided with an accurately bored hole in its center into which a plug gage can be inserted. The cutter then can be pushed against the plug gage before tightening the set screws. This

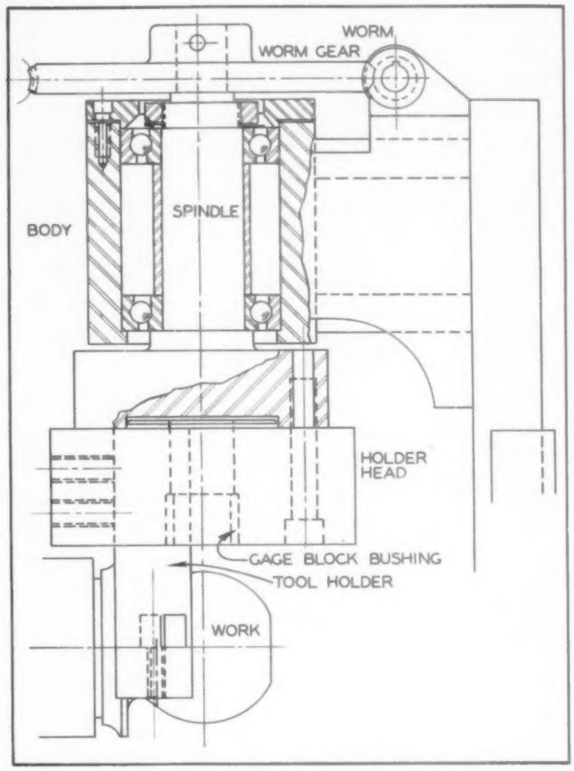


FIG. 4

step facilitates set-up and helps assure correct diameter of the sphere.

The spindle is mounted to the body with grease-sealed ball bearings and fastened with standard locknut and lockwasher. A 12-pitch worm gear with 80 teeth, together with a matching worm, provide the hand-operated drive. For larger production runs the unit can be fitted with a small motor and clutch for more uniform feeding.

The special head is mounted in one station of the hex-turret. Two other stations are used for stopping and turning, while the square turret holds the parting tool and the rough forming cutters.

Actual tooling cost of the set-up totalled $255; and the unit turned out 4½ complete pieces per hour.

Increasing Stainless Hardness by Sub-zero Working

HOPE FOR MAKING stainless steel a more versatile metal comes from following the unexpected lead of finding magnetism in a fractured piece during routine tests. The resultant process may make that metal some 100 percent harder than has previously been possible with metal-working methods.

During fundamental investigations of cast stainless steels at Crane Company laboratories, impact tests were conducted at the temperature of liquid nitrogen or about 300 deg F below zero. One of the samples, which had return to room temperature was tested and showed strong magnetic effects near the fracture. Through subsequent study, it appeared that increased permeability was the result of the combination of severe plastic deformation caused by the impact tests plus the low temperature.

Further co-operative studies made by engineers of the Westinghouse Research Laboratories and the Crane Company covered the effects of rolling and drawing at sub-zero as well as at very high temperatures. Significantly, highest hardness and strength values were obtained in specimens rolled at the lowest temperatures; while tensile strength, yield stress and hardness appeared to increase.

Effect of Fluids

on Tool Tip Temperatures

By Joseph D. Pigott[1] and
Leonard P. Richardson[2]

THE LIFE OF cutting tools in machine shop practice has long been a major production problem. With the higher machine speeds of today, the problem has become increasingly dependent upon the localized hot strength of the tool tip and thus of the chip-tool interface temperature.

At all cutting speeds some welding occurs between the chip and the tool resulting in the formation of a hard appendage on the tool commonly known as a *built-up edge.* The built-up edge is quite extensive at low cutting speeds and periodically is freed from the tool tip and passes with the chip across the face of the tool. Abrasion of the tool results from this sliding contact and a crater gradually forms some distance from the tool point. At relatively slow cutting speeds a crack frequently starts at the base of the crater and the tool fails when the cutting edge crumbles away, even though the bulk of the tool material has maintained its hardness and strength.

At relatively high cutting speeds experiments show there is much less tendency to form a built-up edge and a cutting tool frequently fails due to a loss in hardness at the tool point. This loss in hardness results from the high surface temperatures that are associated with high speed machining. When metal is cut practically all of the energy consumed is converted into heat in two ways: (1) by the plastic deformation of the metal cut, and (2) by friction between the chip and the face of the tool. The heat that is thus developed may be carried away in the chip, be conducted away through the workpiece or be radiated to the atmosphere or transferred to a cutting fluid.

In any complete investigation of the machining characteristics of a material it is advantageous to investigate the manner in which the important temperature at the interface between the chip and the tool varies with different cutting conditions. Offhand it might appear that a direct measurement of this interfacial temperature would be difficult. The

[1]Present address: Research Engineer, The Draper Corporation, Hopedale, Massachusetts

[2]Present address: Development Engineer, Shell Research and Development Company, Emerville, California

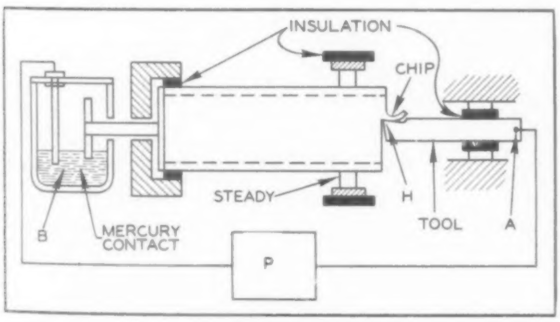


Fig. 1. Schematic diagram above illustrates test apparatus used for tool tip temperature investigations.

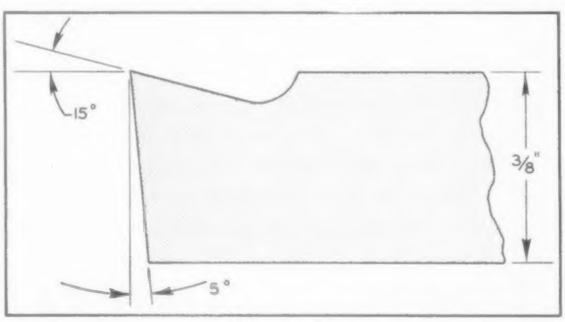


Fig. 2. A simple design was chosen for the test tool, as shown above, to eliminate various side effects.

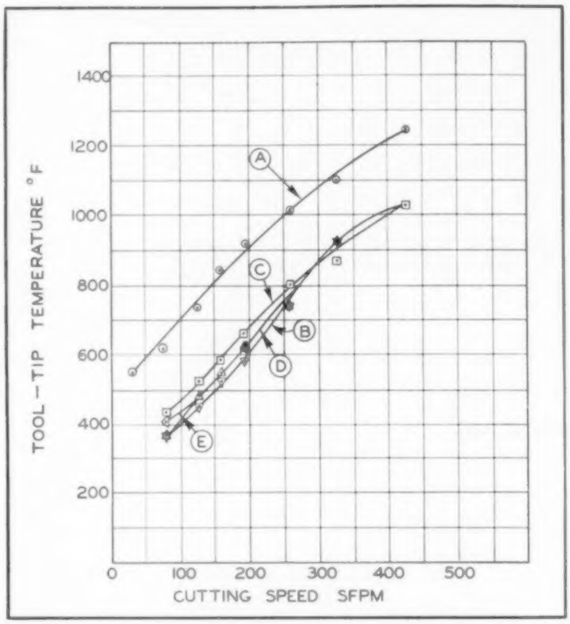


Fig. 3. Cutting speed versus temperature is plotted above. Depth of cut on this test is 0.0023 in.

large temperature gradient through the workpiece from the tool point precludes the possibility of using thermocouples embedded in the workpiece close to the machined surface to predict the true surface temperature.

By far the most successful approach to the problem has been the tool-work termocouple apparently first used by Shore[1] in 1924 and since used by many investigators. In this method the tool-work contact area serves as the hot junction in a thermoelectric circuit and the emf generated is proportional to its temperature. Actually the maximum tool tip temperature is not measured but rather the average temperature over the area of contact between the chip and the tool. Since the tool face on a microscopic scale is not a plane surface but rather a series of peaks and valleys the hot junction is essentially a series of small thermocouples in parallel, all of which add to the observed emf.

Apparatus Used

The test arrangement employed in this investigation is shown in Fig. 1. All tests were conducted on a 5 hp Monarch lathe providing a range of spindle speed from 21 to 900 rmp and a range of feeds from 0.0023 in/rev to 0.0104 in/rev. The workpieces were all obtained from the same bar of SAE 1015 plug pierced seamless tubing. This tubing had an outside diameter of 2 inches and a wall thickness of 3/16 inch.

The tools employed in these tests were all obtained from the same 3/8 inch square bar of 18-4-1 high speed steel. The shape of the tools employed is shown in Fig. 2. This particular shape was chosen because of its simplicity. Thus, the effects of nose radius, side rake and so forth on the observed temperature have been eliminated and the true effect of fluids on tool temperature more directly determined. In order to employ the simple two-dimensional tool shown in Fig. 2 it was necessary to cut the work from the end which accounts for the choice of seamless tubing as the work material.

The thermoelectric circuit employed is shown in Fig. 1. One cold junction is at *A* where a copper lead joins the tool and the other is at *B*. These points are far enough removed from the hot junction *H* so that they remain at constant temperature. The emf generated is thus a function of the temperature at *H* only and was measured by means of the manually operated potentiometer *P*. The particular materials constituting the tool and workpiece were calibrated by mounting an ordinary chromel-alumel thermocouple in the workpiece near the tool point and measuring the emf developed in the tool work thermocouple and in the chromel-alumel couple when each were at the same temperature.

In order to assure that all tools used were of similar keenness an arbitrary reference speed of 160 fpm was used and the emf for each new tool was noted. A given tool was also periodically checked at the reference speed and when it no longer gave the standard emf, a new tool was substituted.

Results and Discussion

Series of tests were run at 10 speeds at the following three depths of cut: 0.0023 in/rev; 0.0052 in/rev, and 0.0104 in/rev. A series of tests was run for each of the following conditions:

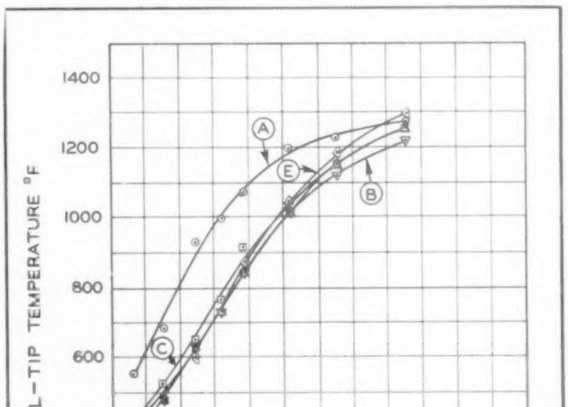


Fig. 4. Depth of cut is 0.0052 in. on this plotting of cutting speed versus depth of cut.

[1]Shore, H: Thesis MIT, 1924

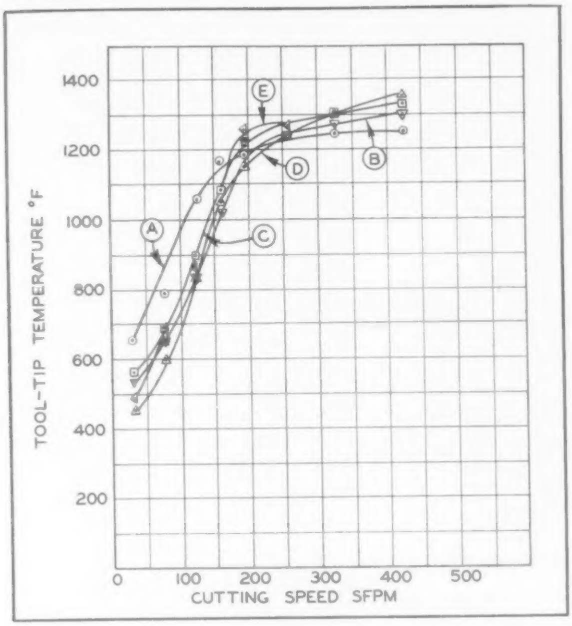


Fig. 5. Temperature increases with depth of cut as seen here, with depth of 0.0104 in. in speed vs. temperature plotting.

1. Dry cutting
2. Cutting with a commercial emulsifiable type cutting fluid in concentration 40 to 1
3. Cutting with a commercial soluble fluid in concentration 40 to 1
4. Cutting with water containing a rust inhibitor
5. Cutting with water containing a rust inhibitor and a wetting agent.

Figs. 3, 4 and 5 show the results obtained with each of the cutting fluids for depths of cut of 0.0023 in/rev, 0.0052 in/rev and 0.0104 in/rev respectively.

The speed-temperature data for the dry runs given in Figs 3 to 5 show that the temperature increase per unit increase in speed becomes smaller as the speed increases. At any given speed the temperature is seen to increase with depth of cut as might be expected. The dry curves seem to approach an asymptote which coincides with the transformation temperature of SAE 1015 steel (1333 deg F). At this point it would appear that all energy supplied in cutting is absorbed in the phase transformation from ferrite and pearlite to ferrite and austenite without an increase in temperature. If it were possible to operate at still higher speeds, the curves might show a further increase in temperature with speed after the phase transformation is complete.

A marked similarity exists among the speed-temperature curves obtained with fluids at a given depth of cut. The following observations may be made when the fluid tests are compared with those carried out with dry tools.

1. In general, at a given speed, the tool-tip temperature with all fluids tested was lower than the dry temperature at the tool tip.

2. The greater the depth of cut, the lower the speed at which the fluid loses its cooling effectiveness. At a depth of cut of 0.0023 in/rev, the fluid was effective at all speeds; at a depth of cut of 0.0052 in/rev, the fluid became ineffective at 400 sfpm; and at a depth of cut of 0.0104 in/rev, the fluid lost its cooling properties at about 200 sfpm.

3. At any given speed, as the depth of cut is increased, the coolant becomes less effective. The extreme case of this condition is shown in Fig. 5 (depth of cut= 0.0104 in/rev), where the cutting temperature is only slightly reduced by the fluid over the entire range of speeds. The cooling properties of fluids become less effective (and their effect less significant) as the rate of heat generation increases.

4. Generally speaking, all fluids tested, including water, had approximately the same cooling effect. Assuming that water possesses no lubricating properties, the decrease in temperature is due in much greater part to the cooling effect of a fluid than to its lubricating effect.

5. A comparison of tool-tip temperatures and temper colors for chips obtained for dry and wet runs at a depth of cut of 0.0104 in/rev and speeds of 436 sfpm and 332 sfpm is of interest.

***Speed* (sfpm)**	***Chip Color***	***Temper Color Temperature* (Deg. F) *Dry***	***Tool-tip Temperature* (Deg. F)**
332	dark straw	490	1250
436	deep blue	520	1250
		Wet	
332	natural	under 400	1250
436	natural	under 400	1250

Thus the fact that a chip is blue when run dry and natural when run with fluid does not necessarily mean the tool is running much cooler with fluid. The fluid shields the chip from the oxidizing action of the air and lowers the bulk chip temperature, so the natural-colored chip results. However, the tool-tip temperatures may be almost identical in each case.

The chief result of this investigation may be briefly stated as follows. While water base cutting fluids may be effective in reducing the temperature at the chip tool interface at lower speeds and with relatively light cuts, the effectiveness of such fluids decreases with the volume of metal removed per unit time and with the speed until a point is reached at which there is essentially no reduction in chip-tool interface temperature.

Statistical Aids for Tool Engineering

By Lawrence E. Doyle
ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING
UNIVERSITY OF ILLINOIS

Part II—Probability and The Accumulation of Tolerances

In the first of this series of articles, some of the principles of statistics were presented, with the promise that they offered means of dealing with important tool engineering problems. In this second part, the application of statistical techniques to problems of tolerance accumulation will be treated. As a basis for comparison, the facts concerning total tolerance accumulations will be considered and illustrated first.

Total Tolerance Accumulation

Fig. 1 is a cross section of three gears on a shaft between two faces of a housing. Each gear has a hub thickness of 1.000 ± 0.0002 inch. The total thickness of the three gear hubs may be 3,000 ± 0.006 inches. The dimension between the faces of the housing bosses is A ± 0.003 inches. Thus, the clearance C may have a total possible variation of ± 0.009 inch.

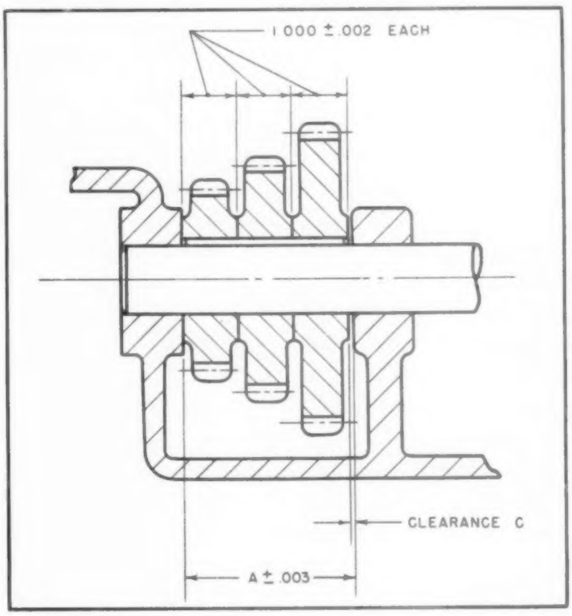
Another example of tolerance accumulation is given by Fig. 2. There a gear is shown with a rim thickness of 0.750 ± 0.001 inch. The rough overall dimension is 2.032 ± 0.005 inches. The end of the hub is faced to 2.000 ± 0.002 from the locating face of the rim. The stock removal may be 0.032 ± 0.007 inches in production, and the resulant dimension is 1.250 ± 0.003 inches.

These examples illustrate that it is possible for a resultant dimension to have deviations as large as the sum of all the largest deviations of its components. That is true whether the dimension results from the addition or subtraction of other dimensions. Therefore, to include all possible discrepancies, the tolerance of a resultant dimension must be the sum of the tolerance of its components. But it is usually unlikely that a resultant dimension will be found often to be near its extreme limits.

Probable Accumulation

For the overall thickness of the three gears of

Fig. 1. Tolerance accumulation on these three gears, each 1.000 ± 0.002 in. thick, amounts to ± 0.009 in.



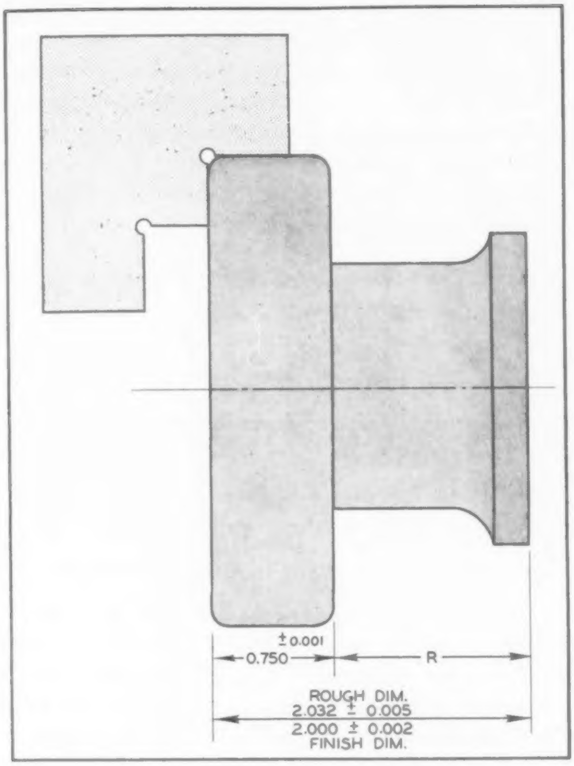


Fig. 2. Another example of cumulative tolerance dimensions. Here the total variation may reach ± 0.003 in.

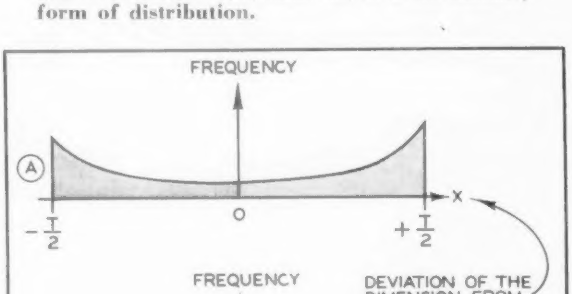
Fig. 1 to be 3.006 inches, it is necessary that each gear in the assembly be at its high limit. The same is true of the low limit. If gears are picked at random, the chance of getting three all at the same high or low limit is less than the chance that some or all will be in between. Also, for a dimension like the hub thickness, the probability of producing gears having extreme dimensions is usually less than having intermediate dimensions. Thus, it is evident that very few of the assemblies are likely to reflect extreme variations.

A small proportion of the gears assembled like in Fig. 1 will have an occasional thickness near the high limit of 3.006 inches. Likewise, only a small proportion will probably be near the low limit of 2.994 inches. Thus, the variation in clearance for most assemblies will probably be much less than the maximum of 0.018 inch. This suggests two possibilities. One is that a tolerance less than ± 0.009 inch may be specified for the variation in the clearance, with the expectation that only a very small number of assemblies will come outside of the smaller tolerance and will have to be reworked. The other is that for a tolerance of ± 0.009 inch applied to the clearance, the tolerances of the hub thicknesses and between the faces may be increased with only a small loss in assemblies. The natural questions arising from these propositions are the following: How much may the clearance tolerance be reduced and what loss is likely to result? Also, how much may the individual tolerances be expanded and what loss is likely to be experienced? Statistical methods can be used to give the answers to such questions as these.

The deviation of a dimension from its mean or ideal value in production may be represented by a frequency distribution within its tolerance. The nature and some properties of frequency distributions were described in the first article of this series. Fig. 3A depicts an unlikely form of distribution, shown for contrast. A large proportion of the deviations fall near the upper limit, $T/2$, or the lower limit, $-T/2$. On the other hand, for a distribution like that of Fig. 3B, few deviations will approach the possible extremes, $T/2$ and $-T/2$, and the working limits may very well be placed inside of $T/2$ and $-T/2$, say at a and $-a$, with little loss.

A distinction must be made between the natural tolerance of a dimension and its specified tolerance. The natural tolerance is the range the operation producing the dimension is able to hold, while the specified tolerance is that called for on the drawing. In some cases, the errors in a process may fall well within the specified tolerance. In other cases, the natural tolerance may exceed the specified tolerance. If that is the case, the pieces outside of the specified tolerance can be rejected, leaving a distribution within the specified limits. That might have been done to get a distribution like Fig. 3A. On the other hand, if the distribution of Fig. 3B includes all the deviations experienced in an operation, the limits of $+\frac{T}{2}$ and $-\frac{T}{2}$ in Fig. 3B are properly those of the natural tolerance. The corresponding specified tolerance may be that, or anything else such as from $+a$ to $-a$, depending upon requirements. Thus, when reference is made to a distribution within a tolerance, it should be understood that the limits of the tolerance correspond to the limits of the distribution. It is not

Fig. 3. The sketches shown below illustrate two contrasts in deviation. At A is an unlikely form of distribution.



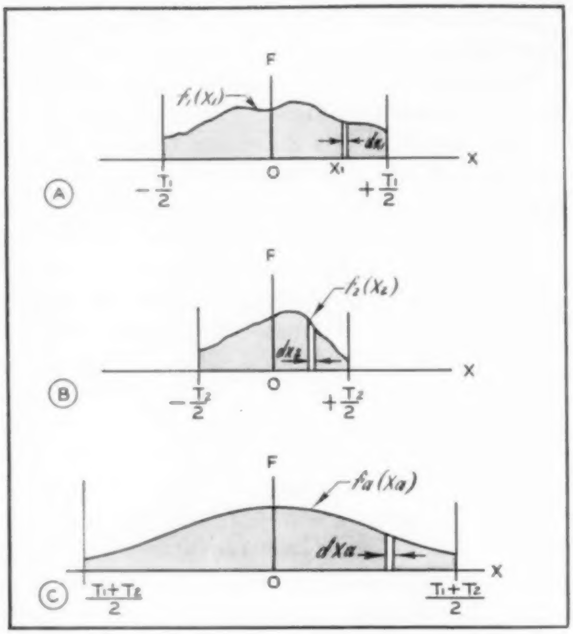


Fig. 4. Shown at A and B are component distributions which together make up C—a resultant assembly variation.

always safe to assume that a specified tolerance will define the limit of a distribution of errors realized in production.

The ordinates of the curves of Figs. 3A and 3B, represent the frequencies of occurrence of their respective deviations. In addition, they may be thought of as standing for the probabilities of the occurrence of the same deviations.

A resultant distribution may resemble Fig. 3A or 3B or even have some other form. But whatever its form, that depends upon how its components are selected and upon their individual distributions. If those conditions are known, an estimate can be made of the distribution of the resultant.

Normal Distribution

Suppose that several different dimensions have variations that are normally distributed. If they are added together, the resultant dimension will also have its variations normally distributed. This may be illustrated by the gears of Fig. 1. Assume that the deviations from 1 inch of the hub thickness have a normal distribution. Let gears be taken at random and assembled. The deviations from a 3 inch assembly thickness will then have a normal distribution.

A theoretical normal curve extends from minus infinity to plus infinity. But 99.73 percent of the area under a normal curve lies inside the $\pm 3\,\Delta$ limits. Thus, if the components and assembly of Fig. 1 all have their errors distributed normally, 99.73 percent of the pieces and assemblies will be found inside the $\pm 3\,\Delta$ limits of the distributions. Where quality is controlled, tolerances are often set to correspond to the $\pm 3\,\Delta$ limits. That is, the tolerance of a dimension is equal to $6\,\Delta$.

A well known theorem, proven in elementary statistics texts, states that for any kind of distribution the square of the standard deviation of the resultant is equal to the sum of the squares of the standard deviations of the components. That may be written in the following form.

$$\Delta s = \Delta_1^2 + \Delta_2^2 + \Delta_3^2 + \ldots + \Delta_n^2 \qquad (1)$$

In that equation

$\Delta s =$ the standard deviation of the resultant dimension.

$\Delta_i =$ the standard deviation of any component, where i may be 1, 2, 3, etc.

Now if $T_1 = 6\Delta_1$, $T_2 = 6\Delta_2$, $\ldots$ $T_n = 6\Delta_n$,

$$\sqrt{6}\Delta s = \sqrt{(6\Delta_1)^2 + (6\Delta_2)^2 + (6\Delta_3)^2 + \ldots \ldots + (6\Delta_n)^2}$$

$$\text{and } T_p = \sqrt{T_1^2 + T_2^2 + T_3^2 + \ldots + T_n^2} \qquad (2)$$

T_p is the tolerance that may be applied to the resultant dimension with the likelihood that 99.73 percent of the deviations will be within its confines. That tolerance is always less than T_S, the tolerance that includes all possible deviations, because

$$Ts = T_1 + T_2 + T_3 + \ldots + T_n$$

The tolerance T_p can never be less than the largest component tolerance and is always less than the sum of the component tolerance. It must be understood, though, that T_p is significant only when the component distributions are approximately normal and when the individual pieces are selected at random for assembly.

Example 1. Assume that the distribution is normal for the hub thickness of each gear and the distance between the boss faces of Fig. 1. The tolerance of the overall thickness of 3 gears in an assembly is then

$$T_{gp} = \sqrt{0.004^2 + 0.004^2 + 0.004^2}$$

$$= 10^{-3} \text{x} \sqrt{16 \text{ x } 3} = 0.0069 \text{ inch.}$$

This is little more than half of the sum of the individual tolerances, which is 0.012 inch.

The variation of the clearance to $\pm 3\Delta$ limits is

$$T_{cp} = \sqrt{0.004^2 + 0.004^2 + 0.004^2 + 0.006^2}$$

$$= 10^{-3}\sqrt{48 + 36} = 0.0092 \text{ inch,}$$

as compared with a total possible variation of 0.018 inch.

Example 2. Assume that for the gear of Fig. 2 the variations of the 0.750 inch rim thickness are normally distributed with $\pm 3\Delta$ limits at $\pm$ 0.001 inch. Also, the 2.032 inches overall rough length varies normally within its $\pm$ 0.005 tolerance. The finished dimension, 2.000 $\pm$ .002 inches, is produced by a process having normal variations.

What tolerance may be applied to dimension R if no more than 27 pieces in 10,000 are to come outside of that tolerance? What is the probable amount of stock removal?

The tolerance for dimension R should be

$$T_{rp} = \sqrt{0.002^2 + 0.004^2}$$
$$= 10^{-3}\sqrt{4+16} = 0.0047 \text{ inch.}$$

Thus dimension R may be expressed as 1.250 ± 0.0023 inches.

For the stock removal.

$$T_{sp} = \sqrt{0.010^2 + 0.004^2}$$
$$= 10^{-3}\sqrt{100+16} = 0.0108 \text{ inch.}$$

and the probable amount of stock removal is 0.032 ± 0.0054 inch.

The Addition of Other Kinds of Distributions

Figs. 4 A and B show two component distributions. One represents variations in a dimension between $-T_1/2$ and $T_1/2$. The other contains the variations of a second dimension between the limits of $-T_2/2$ and $T_2/2$. Pieces are taken at random from the two lots to make an assembly having the resultant dimension with variations distributed between $-\frac{T_1+T_2}{2}$ and $\frac{T_1+T_2}{2}$, as indicated at C in Fig. 4. The curve of A is designated as $f_1(x_1)$; of B as $f_2(x_2)$; and of the resultant of C as $f_a(x_a)$.

The probability of the occurrence of any deviation, x_a, in the resultant may be thought of as the small element of area $f_a(x_a)\,dx_a$. But x_a results from two compound deviations x_1 and x_2, so that

$$x_1 + x_2 = x_a. \qquad (3)$$

For a given value of x_a, x_1 and x_2 may have many values, as long as they add to x_a. If a value of x_2 is chosen, it becomes a constant at that instant and determines x_1 for the specified x_a. Thus, $dx_1 = dx_a$. A part of $f_a(x_a)\,dx_a$, which may be designated as $fa_1(x_{a1})\ dx_a$, results from the product of two areas $f_1(x_1)\,dx$, and $f_2(x_2)\ dx_2$. Thus,

$$f_{a1}(x_{a1})\ dx_a = f_1(x_1)\ dx_1 \,.\, f_2(x_2)\,dx_2 \qquad (4)$$

The total area $f_a(x_a)\,dx_a$ is the sum of all of its parts like $f_{a1}(x_{a1})\,dx_a$. Since these parts are infinitesimal, their sum may be expressed by an integral

$$f_a(x_a)\,dx_a = dx_1 \int f_1(x_1) \,.\, f_2(x_2)\,dx_2 \qquad (5)$$

But $dx_1 = dx_a$, so the equation of the resultant distribution curve is

$$f_a(x_a) = \int f_1(x_1) \,.\, f_2(x_2)\,dx_2 \qquad (6)$$

In any particular case, limits must be defined for the integral. To solve equation (6), the forms of $f_1(x_1)$ and $f_2(x_2)$ should be known. For values of x_1 in $f_1(x_1)$, the expression $(x_a - x_2)$ may be substituted according to equation (3).

If more distributions are to be added, another may be combined with that of $f_a(x_a)$, in the same way as explained for the original two. Still another may be added to the second resultant, and so on.

The expression for the resultant curve, like equation (6), is one step towards the solution of the problem of establishing a suitable resultant tolerance. After that further treatment is necessary. Specific forms of this problem will be considered in the next article.

. . . Some Precision Grinding Problems

(Continued from page 32)

tions in machining, heat treating or grinding procedures, nor was there anything suspicious about the microstructure. It was clear that certain lots of the steel were extremely sensitive, but it was not possible to find any reason for this condition. The only immediate solution was to improve grinding practice as much as possible even though this meant somewhat higher production costs. Meanwhile, records are being kept of the source of the steel in each lot of shafts to see whether or not the sensitive lots can be traced to some particular supplier.

Miscellaneous Sources of Trouble

Several other types of difficulty that have been encountered in trouble shooting connected with grinding operations deserve a least brief mention. Faulty heat treating procedures can cause quench cracks and soft spots to form. The cracks can generally be distinguished from those occurring during or after grinding by their much greater depth and the absence of any relationship to the direction of the grain marks left in the work surface by the wheel. As for the soft spots, which can be revealed by etching in weak nitric acid, they are highly irregular in shape and have rounded outlines, in sharp contrast to burn marks from the grinding wheel which are clearly related to the grain marks.

Sometimes the heat treatment may leave the steel badly stressed in one or more areas, but not enough to crack. Grinding can act as a trigger to upset this stress condition with the result that one or several deep cracks are formed with directions corresponding to the heat treating stresses. Even though such cracks are not present in the steel prior to grinding, they originate primarily not in the grinding operation but in the stress left from heat treatment.

Engineering Aspects of

Tool and Die Welding

By Arthur R. Butler
PRESIDENT
WELDING EQUIPMENT AND SUPPLY COMPANY

Part II—Classification of Tool and Die Steels

THE HARDNESS DEVELOPED in weld depositions of tool steel welding electrodes "as-welded" and as "heat-treated" will vary according to the following principal factors:

(a) Pretreatment—such as the preheating temperature employed.
(b) Technique employed during the welding sequence.
(c) Admixture of the base metal with the deposit, as the type of steel to which the electrode is applied will influence the hardness "as-welded" or when "heat-treated".
(d) Rate of cooling determined by mass, as the object being welded acts as indirect cooling or quenching medium.
(e) Tempering temperatures employed after welding.

Proper preheating of units to which tool and die electrodes are applied is highly important. Preheating is well recognized as a crack preventive measure. The degree of preheat is a primary factor in the effect on the hardness developed in weld depositions because it tends to delay the rate of air quenching. For a given condition of welding (current, welding speed, etc.), cooling rates will be faster for a weld made without preheat than with preheat. Preheating is also beneficial in reducing or preventing shrinkage stresses and deformation. Manufacturers of tool and die welding electrodes generally recommend temperature ranges for preheating each class of steel. It is important that the preheat temperature does not go beyond the minimum nor exceed the maximum while welding so that the hardness will not be affected.

The technique employed during the welding operation, other than preheating, admixture, rate of cooling and tempering affects the hardness of weld depositions. Reverse polarity on d-c welding current is recommended as it tends to minimize the penetration of the arc resulting in less admixture with the base metal and production of uniformity of hardness.

Size of the electrode selected may slightly influence hardness of weld depositions. It is recommended that the smallest electrode be selected that will accomplish the job. Less volume of heat is required which will have a reflection on the ultimate hardness of the weld depositions.

Current Values Important

Arc voltage and amperage also influence hardness of weld depositions. Tool and die welding electrodes should be applied, utilizing a close arc and current values conducive to proper penetration. Slightly lower amperages than those used for the first passes are recommended on second or finishing beads. Recommended arc currents should be indicated by the manufacturer for each of their products.

Positioning the work, rate of travel and manipulation of the arc may slightly influence weld deposition hardness.

Ultimate hardness and characteristics of weld depositions made with tool and die electrodes can be enhanced by the practice of peening very thoroughly. Extended depositions should not be made before peening is instituted. Peening at forging temperatures has the advantage in that hot metal is more ductile. The value of peening weld metal

(the process of working metal by means of rapid hammer blows) is well recognized. The chief effects of peening consist of relieving shrinkage stresses, correcting distortion, improving physical properties and also refining the metallurgical structure.

The type of steel to which tool and die welding electrodes are applied influences the hardness of depositions "as-welded" or when "heat-treated". The admixture or dilution of the depositions with the base metal produce weld metal that is alloyed in direct proportion to the combined alloys contained in the electrodes themselves and the parent metal. Inasmuch as alloys, such as carbon and chromium, are placed in steel to enhance their hardenability, the percentages of these elements present in the weld depositions influence the hardness.

Tempering for Toughness

The rate of cooling after welding, which is governed by the preheating temperature employed and the size of the object being welded, affects the ultimate hardness of weld depositions. The larger the object, the slower the air quench. Conversely, the smaller the object the more rapid the air quench. It follows naturally that the degree of preheat utilized also governs the rate of cooling and air quenching.

Tempering weld depositions of tool and die electrodes is a very important factor. In welding, changes take place in the steel that require tempering. A heat-treatment man would not think of hardening a tool steel without tempering it afterwards. Therefore, to gain the same results, weld depositions should be tempered. Tempering yields toughness with very little depreciation of hardness. It refines the grain structure and relieves stresses and strains set up in the welding operations. Size governs the length of time of the draw, never less than one hour. On a partial repair, the tempering temperature employed should be according to the draw-range temperature of the base metal. If a full repair has been made the tempering temperature employed should be according to the recommended draw-range temperature of the electrode that is utilized. Manufacturers of tool and die welding electrodes should indicate temperature ranges of their various products. The alloy welding electrodes that are generally utilized in tool and die welding are non-affected by any heat-treatment. Any hardness increase must be accomplished through work hardening.

There are literally hundreds of different brands of tool steels on the market, made by approximately one hundred manufacturers. Eliminating the metal-cutting and sintered carbide brands, which are not pertinent to tool and die welding, the various brands can be grouped into four general classifications: water hardening, oil hardening, air hardening, (including high speed steel), and hot working.

Typical of repair jobs on dies which can be accomplished with welding is this application on drop forging dies.

Water Hardening Tool Steels

(To be welded with water hardening tool steel electrodes).

There are varieties of water-hardening tool steel having slightly different analyses to obtain certain characteristics such as hardness, wear resistance and toughness.

Average Analysis Straight Water Hardening		Average Analysis Carbon Vanadium Water Hardening	
Carbon	.60 — 1.40	Carbon	.60 — 1.40
Manganese	.25	Manganese	.25
Silicon	.25	Silicon	.25
Alloys	none	Vanadium	.15 — .50

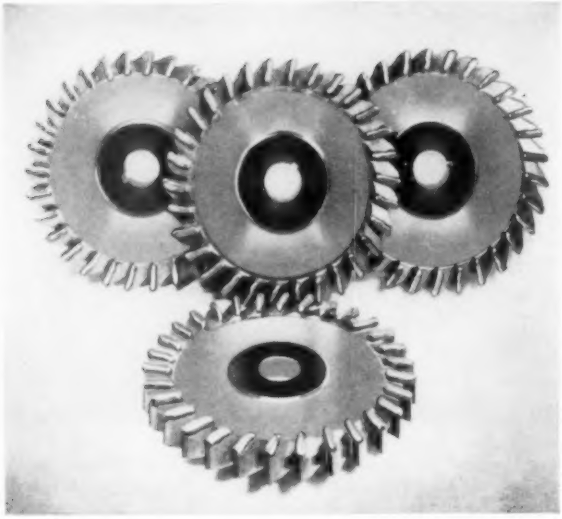
Average Analysis Carbon-Chromium Water Hardening	
Carbon	1.10
Manganese	.25
Silicon	.25
Chromium	10 — .50

Vanadium is added to increase toughness by refining the grain structure. Chromium is added to increase the depth of hardness.

Oil Hardening Non-Deforming Tool Steels

(To be welded with oil hardening tool steel electrodes).

These tool steels are widely used because they have (1) low movement in hardening, (2) high hardness as quenched, (3) high hardness from low quenching temperatures, (4) freedom from cracking on quenching of intricate sections, and (5) maintenance of keen cutting edges.



These side mills were resharpened until unusable, then refluted on one side with HSS welding rods to original width.

Manganese Type: Has the ability to harden in oil from low temperatures—generally used for making small pieces.

Average Analysis

Carbon	.95
Silicon	.25
Manganese	1.60
Vanadium or Molybdenum	.25

Low Manganese Type: Has the ability to harden in oil from low temperatures, but higher than that of the standard manganese type. This feature is desirable when this type of steel is used to make large dies.

Average Analysis

Carbon	.95
Silicon	.25
Manganese	1.20
Tungsten	.50
Vanadium	.20
Chromium	.50

Tungsten Type: Is used where the keenest cutting edge is desirable in addition to the other features.

Average Analysis

Carbon	1.20
Silicon	.25
Manganese	.25
Vanadium	.25
Tungsten	1.75
Chromium	.75
Molybdenum	.25

Chromium Type: Has all of the good qualities of the other types but is generally heat-treated from higher temperatures.

Average Analysis

Carbon	.90
Silicon	.25
Manganese	.25
Tungsten	.45
Chromium	1.60

The four types of oil hardening non-deforming tool steels listed above have quenching temperatures which range from 1400 deg to 1600 deg F. There are also slight variations in the drawing temperatures recommended.

In addition, the oil hardening tool steel group includes the following classifications of tool steels:

Chromium and chromium-vanadium tool steels having varying amounts of chromium ranging from 1.00 to 2.00 and about 0.20 vanadium in the latter case. These types of tool steels have a wide range of usage for the making of shock-resisting tools such as rivet sets and chisels. Because they require oil hardening to develop a medium hardness, they are classified in the oil hardening group.

Also in the oil hardening group are the silicon tool steels, which have a silicon content ranging generally from 1.00 to 2.00, and are used for shock-resisting tools requiring moderate hardness.

Air Hardening Tool Steels

(To be welded with air hardening tool steel electrodes).

Air hardening tool steels for cold work are divided into two main classes: (1) 1 percent carbon with 5 percent chromium type, and (2) high-carbon high-chromium type.

1 percent Carbon — 5 percent Chromium Type: There are steels in this group with variations in the combinations of molybdenum, manganese and vanadium.

This type of air hardening steel is generally used for intricate dies that must retain their shape after heat-treatment. The movement in heat-treatment is about one-quarter that of oil hardening nondeforming steels. The wear resistance of this time is midway between the oil hardening and high-carbon high-chromium steels. This type of steel is either oil or air quenched.

Average Analysis

Carbon	1.00
Manganese	.40 — .70
Chromium	5.00
Molybdenum	1.00

High-Carbon High-Chromium Type: This type of steel is made in variations of combinations of carbon, chromium and tungsten. High-carbon high-chromium types of steel are used to obtain exceptionally high wear resistance combined with remarkable non-deforming qualifications.

They can be either oil or air quenched. Because of the high-chromium content of this type it is practically resistant to oxidation.

Average Analysis

Carbon	1.25
Manganese	.30
Chromium	11.50 — 12.00

Hot Working Tool Steels

(To be welded with hot working tool steel electrodes).

Die steels commonly used for hot work can be divided into four classes: (1) Those in which the essential element is chromium. (2) Those in which the essential element is tungsten or molybdenum. (3) Those in which tungsten and chromium are combined in approximately equal proportions. (4) Those in which the essential element is molybdenum.

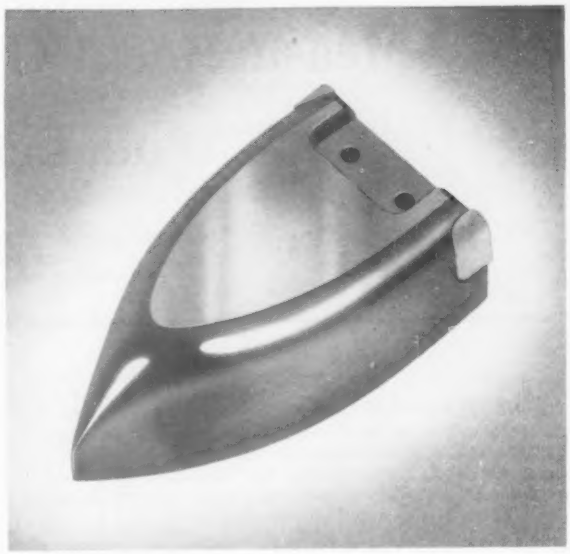
Chromium Type: 0:35 percent carbon—5 percent chromium with silicon, molybdenum or tungsten.

Tungsten Type: 10 percent tungsten—2 percent or 3 percent chromium—15 percent tungsten —14 percent tungsten—2½ percent nickel—2.00 percent molybdenum—11 percent tungsten—1½ percent nickel.

Chromium-Tungsten Type: 7½ percent tungsten—7½ percent chromium.

Molybdenum Type: 6 percent molybdenum—3½ percent chromium—1 percent tungsten.

As a general rule, hot working tool steel has hot working and air hardening characteristics, accompanied by abrasion resistance and exceptional toughness. This type of steel withstands erosive action, alternate heating and cooling without fire-checking—i.e., resistance to the formation of cracks at the surface when alternately heated and cooled. Scaling under hot working is also held to a minimum. This type of steel also resists deformation after temperatures to which they are likely to be heated. The various types of hot working tool steel will retain their hardness while working at temperatures ranging from 800 to 1150 deg F, depending on the type involved.



An engineering change was effected on this oil hardening punch by welding with oil hardening electrodes.

High Speed Steels

(To be welded with high speed steel electrodes).

High speed steels are divided into six distinct classes: (1) Tungsten types, (2) Tungsten-Cobalt types, (3) Molybdenum types, (4) Molybdenum-Cobalt types, (5) Tungsten-Molybdenum types, and (6) Tungsten-Molybdenum-Cobalt types.

Tungsten Type: 18-4-1, 18-4-2, 18-4-3 and the 14-4-2 types. The first numeral in each instance signifying the tungsten content, the second, the chromium content, and the third, the vanadium content.

Tungsten-Cobalt Type: Same as 18-4-1 type plus 5 percent cobalt; same as 18-4-2 type plus 8 percent cobalt; same as 14-4-2 type plus 5 percent cobalt; same as 20-4-2 type plus 12 percent cobalt.

Molybdenum Type: Molybdenum-tungstentype: 8½ percent molybdenum, 1½ percent tungsten; molybdenum-vanadium type: 8¼ percent molybdenum, 2 percent vanadium.

Molybdenum-Cobalt Type: Molybdenum-tungsten type with 5 percent cobalt; molybdenum-tungsten type with 8 percent cobalt.

Tungsten-Molybdenum Type: 5¾ percent tungsten—4½ percent molybdenum; 5¾ percent tungsten—4¾ percent molybdenum—4 percent vanadium.

Tungsten-Molybdenum-Cobalt Type: Tungsten-molybdenum with 5 percent cobalt; tungsten-molybdenum with 8 percent cobalt.

Measurement Over Three Wires of Acme Screw Threads

By H. F. Thompson
JOHN BATH & COMPANY

THE MEASUREMENT over three wires of an Acme thread may be calculated by the exact and complex formulas which involve choice of wire diameter, pitch of thread, thread angle, and lead angle. This results in the necessity from a theoretical standpoint, of having different size wires for each combination of lead angle, thread angle, and pitch.

Fortunately, however, there are approximate formulas which may be employed to advantage in place of the theoretically exact formulas, and which provide a degree of accuracy compatible with that possible in manufacture and inspection.

The following consists of the further simplification of such an approximate formula, by means of which the measurement over wires may be more easily and quickly calculated to the degree of accuracy ordinarily required.

1. Pitch Diam x 3.1416 x Number of Turns per Inch = Cotangent of Helix Angle.
2. Measurement over Three Wires = Pitch Diam + Pitch Diam Addenda (from Table I) + Constant for Helix Angle (from Table II) × Diam of Wires.

EXAMPLES

1 in.—4 triple ¼ P., ¾ L., Acme thread screw
p.8750 pitch diam using 0.12830 diam wires.

1. 0.8750 × 3.1416 × 1⅓ (turns per inch) = 3.6652 = cot. 15°-15′-38″ or 15°-16′.
2. Measurement over wires = .875 + .15738 (Table I) + [.1371* (Table II) × .12830] = .875 + .15738 + .01759 = 1.04997.

* .1371 = interpolation between .135240 for 15°-10′ and .138298 for 15°-20′.

.475-9 N.A.-2G single Acme thread taps P.D.
.4305-.4315 using .06415 diam wires.

1. 431 × 3.1416 × 9 = 12.186 = cot. 4°-42′ say 4°-40′.
2. Measurement over wires = .4305/.4315 + .10554 (Table I) — [.012496 (Table II) × .06415] = .4305/.4315 + .10554 + .0008 = .5368/.5378

.475-9 N.A.-2G double 1/9 P., 2/9 L. double Acme thread taps.
P.D. .4307-.4317 using .06415 diam wires.

1. .4312 × 3.1416 × 4½ = 6.09596 = cot 9°-19′ or 9°-20′.
2. Measurement over wires = .4307/.4317 + .10554 (Table I) + [.050228 (Table II) × .06415] = .4307/.4317 + .10554 + .00322 = .5395/.5405.

TABLE I—WIRE SIZES & CONSTANTS FOR MEASUREMENT OF 29 DEGREE NATIONAL ACME THREADS

(Based on Zero Helix Angle wherein the effect of Helix Angle is neglected)

Threads per Inch	Pitch	Dia. of Best Size Wires	Pitch Dia. Addend	Dia. of Wires	Pitch Dia. Addend	Dia. of Wires	Pitch Dia. Addend
1	1.0000	.51645	.6457496	.50000	.563600	.50000	.56360
2	.5000	.25822	.3228498	.2560	.3117633	.2750	.40665
2½	.4000	.20658	.2582998	.2020	.2354278	.2180	.31533
3	.3333	.17215	.2152501	.1700	.20451326	.19245	.31663
4	.2500	.12911	.1614249	.12830	.15737987	.14433	.23747
5	.2000	.10329	.1291532	10497	.13753968	.11547	.18998
6	.16666	.08608	.10764996	.08600	.10725045	.09622	.15831
7	.14286	.07378	.0922516	.07217	.0842048	.08247	.13570
8	.12500	.06456	.0807374	.06415	.0786894	.07216	.11873
9	.11111	.05738	.0717393	.05773	.0735122	.06415	.10554
10	.10000	.05164	.0645515	.05248	.0687764	.05773	.09499
11	.090909	.04695	.05870508	.04811	.0645096	.05248	.08635
12	.08333	.04304	.05382521	.04441	.0606738	.04811	.07916
13	.07692	.039725	.0496694	.04123	.0572298	.04441	.07307
14	.071428	.03689	.0461296	.03608	.0421062	.04123	.06785
16	.03608	.03228	.0403687	.03207	.039340	.03608	.05937

TABLE II—29 DEGREE NATIONAL ACME THREADS

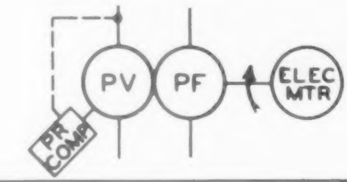
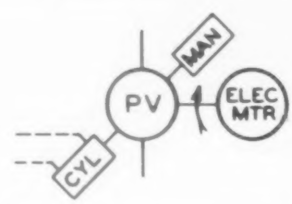
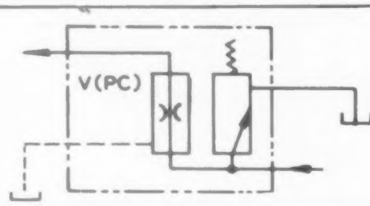
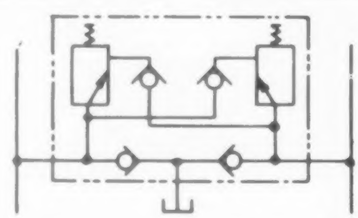
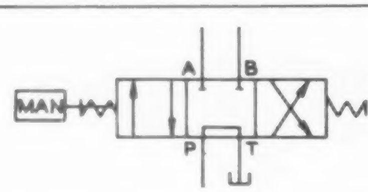
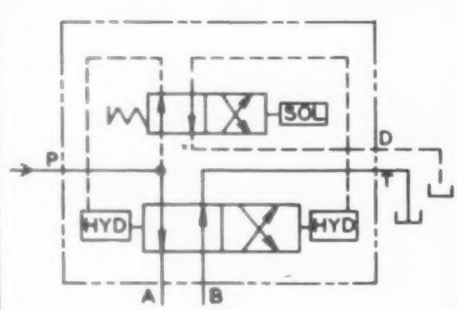
Constants by which the Diameter of Wires is Multiplied to Obtain the Increment which Corrects the Measurement over Wires when the Helix Angle is Taken into Account

Helix Angle	Constant	Helix Angle	Constant	Helix Angle	Constant	Helix Angle	Constant	Helix Angle	Constant
2°	.002273	4° — 50′	.013402	7° — 40′	.033785	10° — 30′	.063807	13° — 20′	.103815
2° — 10′	.002648	5°	.014299	7° — 50′	.035236	10° — 40′	.065863	13° — 30′	.106416
2° — 20′	.003100	5° — 10′	.015283	8°	.036753	10° — 50′	.067988	13° — 40′	.109192
2° — 30′	.003550	5° — 20′	.016267	8° — 10′	.038361	11°	.070077	13° — 50′	.111960
2° — 40′	.004076	5° — 30′	.017326	8° — 20′	.039969	11° — 10′	.072256	14°	.114743
2° — 50′	.004592	5° — 40′	.018375	8° — 30′	.041567	11° — 20′	.074505	14° — 10′	.117518
3°	.005119	5° — 50′	.019513	8° — 40′	.043255	11° — 30′	.076767	14° — 20′	.120389
3° — 10′	.005721	6°	.020650	8° — 50′	.044943	11° — 40′	.079021	14° — 30′	.123252
3° — 20′	.006324	6° — 10′	.021788	9°	.046700	11° — 50′	.081289	14° — 40′	.126199
3° — 30′	.007001	6° — 20′	.022991	9° — 10′	.048469	12°	.083704	14° — 50′	.129163
3° — 40′	.007679	6° — 30′	.024208	9° — 20′	.050228	12° — 10′	.086056	15°	.132200
3° — 50′	.008357	6° — 40′	.025500	9° — 30′	.052078	12° — 20′	.088477	15° — 10′	.135240
4°	.009175	6° — 50′	.026792	9° — 40′	.053928	12° — 30′	.090945	15° — 20′	.138298
4° — 10′	.009930	7°	.028076	9° — 50′	.055924	12° — 40′	.093419	15° — 30′	.141429
4° — 20′	.010760	7° — 10′	.029447	10°	.057779	12° — 50′	.095940	15° — 40′	.144563
4° — 30′	.011591	7° — 20′	.030895	10° — 10′	.059701	13°	.098532	15° — 50′	.147798
4° — 40′	.012496	7° — 30′	.032333	10° — 20′	.061715	13° — 10′	.101137	16°	.151024

JIC Hydraulic Standards for Industrial Equipment

HI. 3 Standard Symbols

(Continued)

EXAMPLES OF COMBINATIONS	
PUMP, DOUBLE-WITH ELECTRIC MOTOR ONE FIXED DISPLACEMENT ONE VARIABLE DISPLACEMENT WITH PRESSURE COMPENSATOR	
PUMP, SINGLE-WITH ELECTRIC MOTOR VARIABLE DISPLACEMENT HAND WHEEL & CYLINDER CONTROL	
VALVE, FLOW CONTROL & MAXIMUM PRESSURE WITH COMPENSATOR	
VALVE, REPLENISHING UNIT	
VALVE, 4 WAY THREE POSITION-SPRING CENTERED MANUAL CONTROL P→T, CYL. PORT BLOCKED IN CENTER POSITION (NOTE: SYMBOL SHOWN IN CENTER POSITION)	
VALVE, 4 WAY 2 POSITION-SPRING OFFSET SOLENOID CONTROL PILOT OPERATED	

JIC Hydraulic Standards for Industrial Equipment

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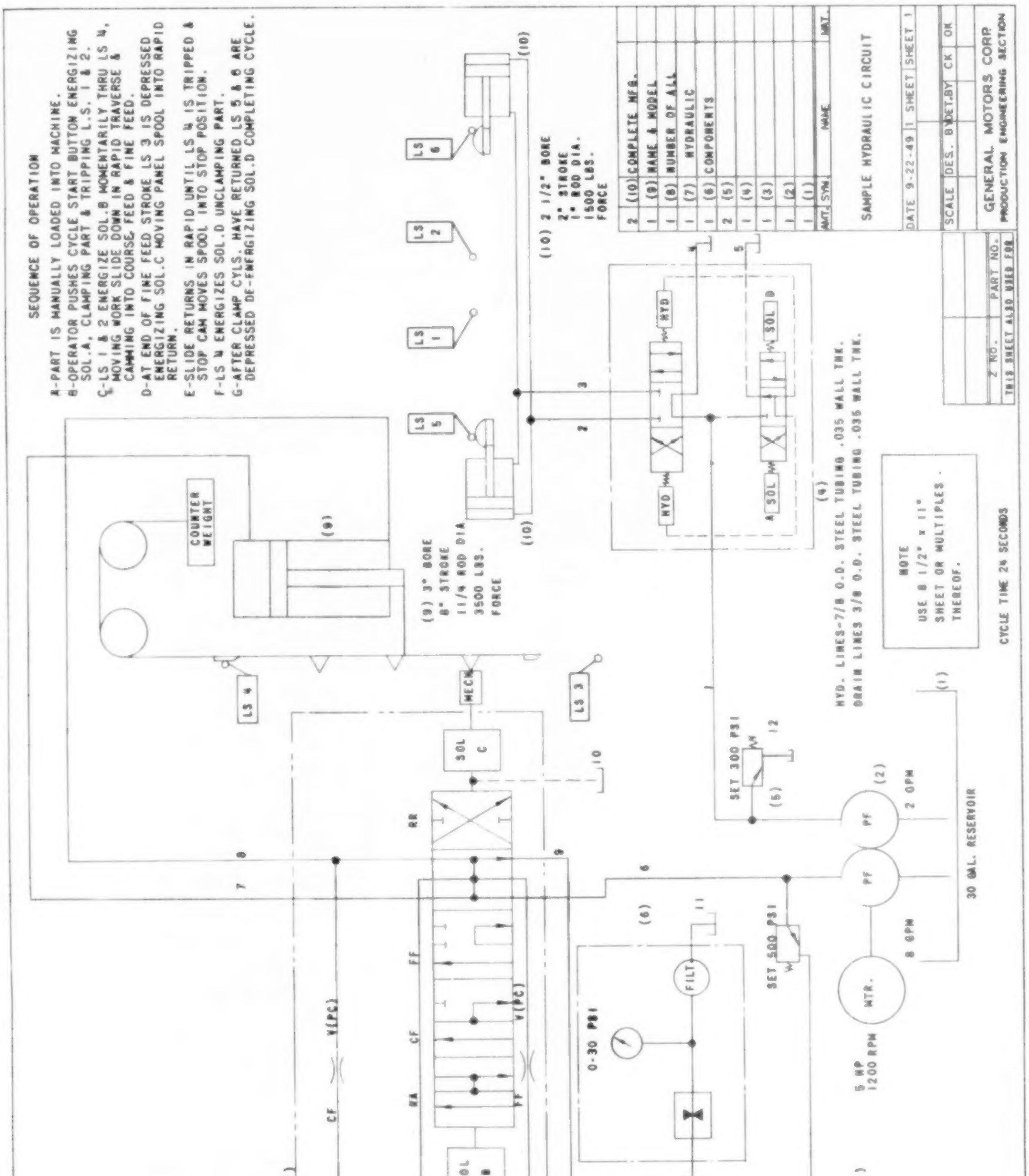
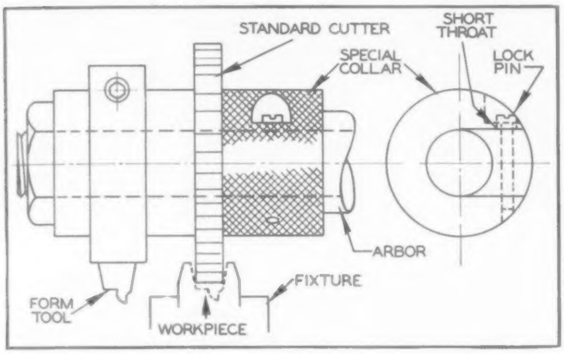


Gadgets

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Spacing Collar Cuts Milling Costs

Having to mill special formed shapes in a relatively small number of workpieces, we eliminated the cost of an expensive form cutter by doing the work in two passes. The parts were first roughed out, using the nearest standard milling cutter, then finished with a fly cutter.

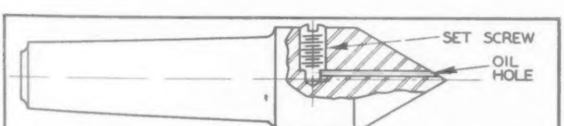


Milling of formed shapes is facilitated by mounting roughing and finishing cutters side by side, with a spacing collar in between. The cutters are transposed for the finishing cut.

While we could have held both cutters solid on the arbor, moving the table in and out against stops, we resorted to a special spacing collar, as shown. After the roughing cut was made, the arbor nut was backed off and the collar removed. The roughing collar was then slid to one side, to clear the work, its place being taken by the fly cutter. Next, the special spacing collar was transposed, end for end, and the arbor nut tightened.

Ian J. Peacock
Carlisle, England

Lubricated Tailstock Center



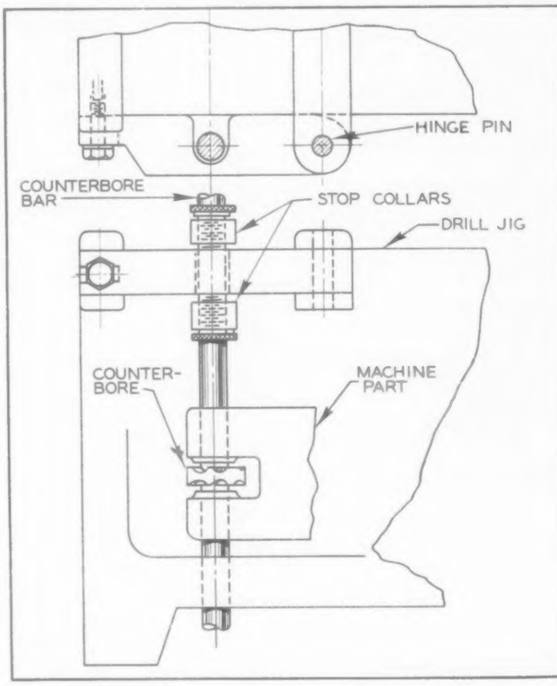
Lathe centers, drilled and tapped as shown, permit pressure lubrication to the tip.

On long runs with heavy work, the lathe dead center will heat up, causing excessive wear. As an easy remedy, drill a hole in from the tip, as shown, and meet it with a larger tapped hole from the side. The larger hole is filled with grease, and a set screw converts it into a pressure fitting.

Frank M. Butrick, Jr.
Alma, Michigan

Double-end Spotfacer

It frequently happens that, due to inaccessibility, slots in machine components must be spotfaced or counterbored instead of milled. This is particularly true in the case of ears or lugs on unwielding parts, where the surfaces must be square in relation to the center line of a bore.



A swinging stop block, a gate, swings clear to permit vertical withdrawal of a double-end spotfacer used to machine unwielding workpieces.

The tool shown combines the advantages of providing opposed spotfacing or counterboring with ready insertion and removal. A swinging cover plate, provided with a slot, swings out to clear the bar for vertical withdrawal of the bar and also acts as a stop gage for both down and draw spotfacing.

While the tool shown has been successfully used in the machining of a cumbersome casting, it may be readily modified to suit specific operations. However, the main feature here is the swinging stop block.

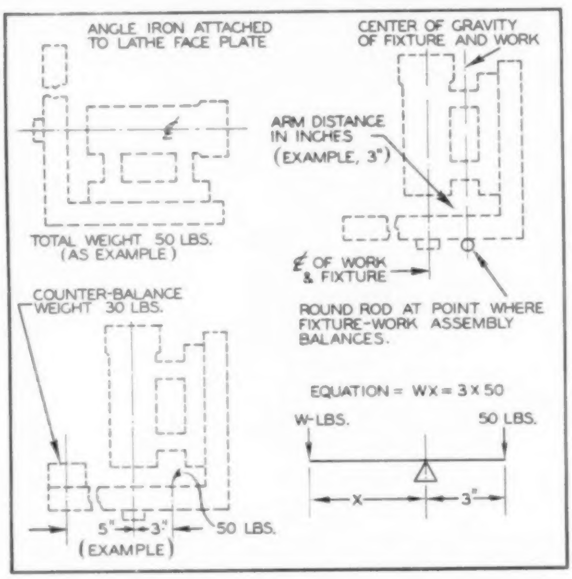
Donald E. Sweet
Marblehead, Mass.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Balancing Work and Fixture

One way to counterbalance lathe fixtures, with mounted workpiece, and to avoid cut-and-try method of filling a hollow counterweight with molten lead until equilibrium is established, is shown here. First, take the complete fixture, with workpiece in place, and weigh it. Then place the back of the fixture, which is mounted on the lathe face plate, on a piece of round rod and move it until it balances. This point of balance is then the center of gravity of the assembly.

Next, scale from the c.g. point to the center of the fixture, which is also the center line of the workpiece. The distance so measured is the "arm" and the combined weight of the fixture and workpiece is the load or force. The equilibrant of this force would be another load, which is smaller and with a longer arm; this however, depending on such conditions as size of face plate and swing.



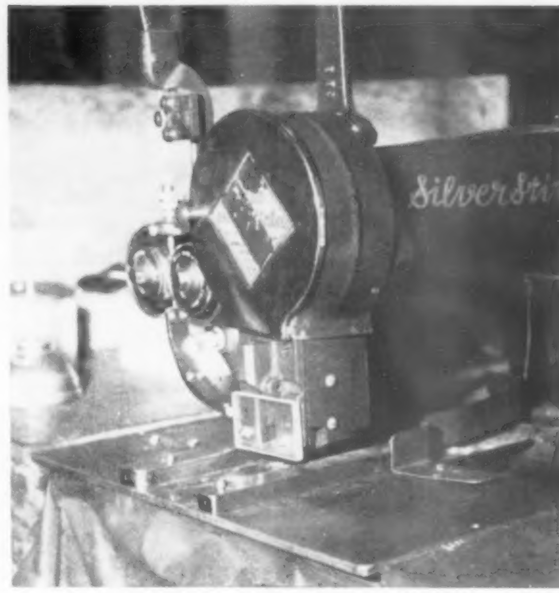
Balancing of lathe fixtures, with mounted workpiece, can be readily solved by calculation, thus obviating cut-and-try methods. In solving the balance position and weight, it is easier to set the distance X, as indicated on the diagram, than to solve for the weight.

Weighing of the counterbalance is not necessary since the volume in inches is easily calculated and, assuming that steel is used, is multiplied by 0.284 lbs.—the weight of one cubic inch of steel. This counterbalance is placed a distance from the center of the fixture which, when multiplied by that distance, would equal the weight of the fixture—work assembly times its arm. Refer to the diagram.

The arm of the counterbalance is taken at the center of gravity of the same, as indicated. Odd-shaped counterbalances are more difficult to calculate; however, a scale and a straight round rod will give the same results.

George J. Whitley
Philadelphia, Pa.

Guard for Stapling Machine



A laminated glass guard protects the operator of a wire stapling machine from injury, also provides clearer visibility with the added advantage of recurrent cleaning without dulling.

A guard, made of laminated glass and placed in front of the dies of a stapling or metal stitching machine, prevents possible finger injuries and also permits full visibility of the work. The guards measure 3 x 1½ in. and cost about $1.00 each.

Usually, these guards are made of ¼ in. plastic, which is ordinarily satisfactory; however, plastic is inclined to dull as a result of repeated cleaning. It is not to be inferred, therefore, that glass is necessarily superior to plastic, as guards, since each safety application has its own requirements.

Incidentally, the photograph shows an operator's apron fastened to the edge of the bench, with the other end hanging down. To use the apron, the operator merely picks up the free end and slips it over her head.

E. Guilbert,
Chicago, Ill.

To Identify Molds

It is often desirable to stamp plastic molds, die casting and forging dies to correspond with the parts numbers. Since, however, such stamping must be in reverse, and reverse-figure stamps may not be at hand, one can use letters which are symmetrical, such as I, V, and X, with which one can make up Roman numerals up to 48. Other symmetrical letters are A, H, M, O, T, U, V and W, all together making up a combination of symbols adequate for all ordinary purposes.

Federico Strasser
Santiago de Chile

Tool Engineering Report No. 1

Elements of Automatic Stock Feeds

By Andrew E. Rylander

THE SHARP TREND to automation, in which the machine embodies the skill and sets pace of production, has practically made automatic stock feeding a "must" in mass manufacture. And while the many automatic and semi-automatic stock feeds commercially available range from small units through huge transfer machines, the most are single-purpose devices and, variations excepted, boil down to a few basic types.

Thus, bar feeds are mainly confined to pushing bars through the spindles of lathes and automatics, as indicated by Fig. 1; magazine feeds to feeding pre-stacked parts into work stations or machine tools; hoppers to selecting, feeding and positioning small parts; and punch press feeds to feeding strip stock through dies.

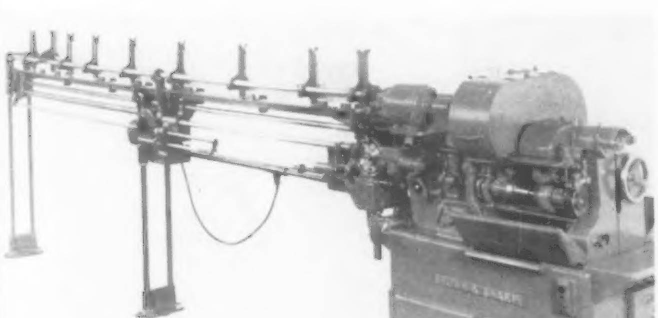
Because there is no such thing as a truly universal stock feeder, it often happens that the tool engineer confronted with unusual problems of stock feeding must either design a feeder from scratch or, where practical, adapt a standard unit to his needs. Where the nature of the job permits, standard equipment should be used.

As an aid to solving problems of stock feeding, and related materials handling, this report will describe feeders suited to various parts and assemblies. Line illustrations will be mainly schematic, with operating principles explained in the captions, the whole designed to present ideas applicable to stock feeding problems rather than details of construction.

Fig. 1, at left, a magazine loading bar feed, manufactured by Browne & Sharpe Mfg. Co., Providence, R. I., for use with B & S automatic screw machines. Rods are magazine loaded and automatically fed to the stock pusher as needed.

A somewhat similar unit, manufactured by Lipe-Rollway Corp., Syracuse, N. Y., employs a pneumatic control system which rejects remnant and restocks the machine, whereupon the stock pusher begins its function. Both of these automatic stock feeders are standard units.

Fig. 2, at right, a "big brother" of the desk stapler—a foot-operated Model EHA Bostitch stapling machine here used to assemble oil filters. Pre-formed staples, fed one-at-a-time from the magazine, join the several laminations without need of previous drilling. Photo by courtesy of Bostitch, Westerly, R. I. A similar principle of magazine feeding is applied by packaging tools, such as the "Steelstrapper" manufactured by Acme Steel Company, Chicago. This tool combines tensioning, sealing and cutting in the one unit.



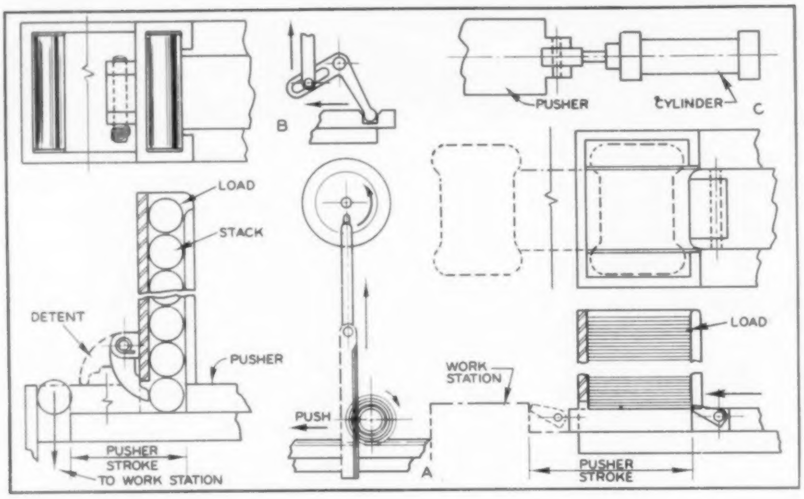


Fig. 3, at left, a magazine feeder for short bars. The part at bottom of the stack is retained by the receded pusher and spring-return detent. At right, a magazine feeder for flat blanks. An "umbrella catch" pawl in the pusher engages the blank on the work stroke, recedes on return stroke. The pushers may be actuated by rack and pinion, as shown at A; by linkage, as at B; or by air or hydraulic cylinder, as shown at C.

Strokes of A and B may be varied by moving the drag link stud in the slotted driving members. Where the pusher is actuated by the press crank, it should ordinarily be in receded position at bottom of stroke, pushing the work into the die on the upstroke.

Magazine Feeds

Perhaps the most universally known magazine feeder is the common desk stapler, which feeds one staple at a time from a clip. Its simple principle has been widely applied to industrial staplers, by means of which metallic or non-metallic laminations—or combinations of both—may be joined without need of previous drilling.

These machines, of which a typical example is shown in Fig. 2, feed pre-formed staples from a magazine, as contrasted to metal stitchers which feed wire from a coil. The principle is also applied to packaging equipment, notably steel strapping tools.

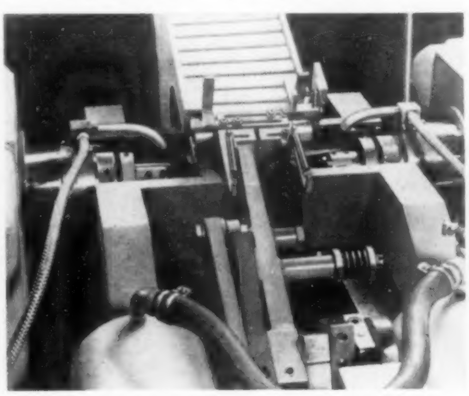
Magazine feeding can be applied to a wide variety of parts provided that they are superficially symmetrical. The line drawing, Fig. 3, shows simple push-type feeds which may be synchronized with the machine cycle by direct linkage or by means of air of hydraulic cylinders. With variations, the simple principle of these feeders may be applied to lathes, drilling, broaching, grinding, and other machines, as suggested by Figs. 1, 4, 5, 6 and 7.

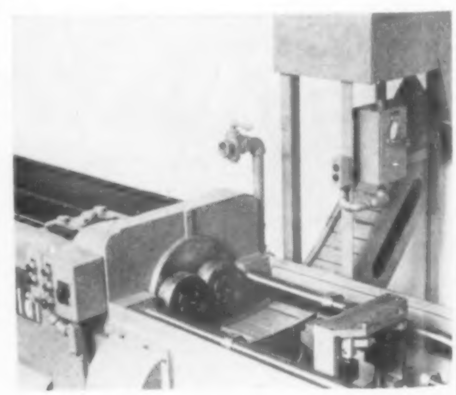
While plain cylindrical, flat, or rectangular parts permit comparatively simple rectilinear actions, considerably greater ingenuity may be required for the automatic loading and unloading of gears. Shown in Fig. 6 is automatic feeding of gears on a dual-head honing machine, the honing cycle being considerably ac-

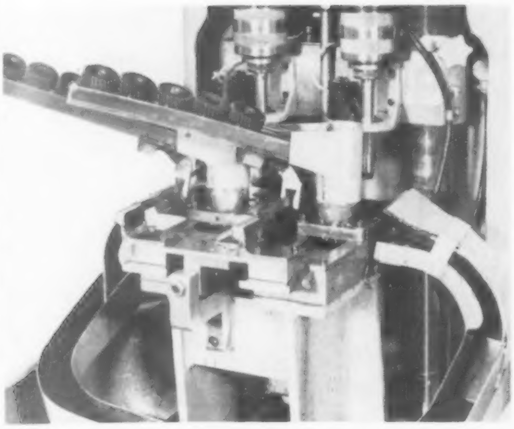
Fig. 4, left and center, magazine loading and unloading of shock absorber tubes on a Lo-swing automatic drilling and centering machine, by Seneca Falls Machine Co., Seneca Falls, N. Y. Gravity fed from the upper chute, the tubes are positioned lengthwise by a loading arm, then lowered into air-operated jaws for clamping. The loading arm then raises to pick up the next tube.

Loading completed, two cutter heads advance in rapid traverse, face, round the tube ends, and chamfer, then retract in rapid traverse. Simultaneously, the vise jaws open to discharge the tubes into the lower chute. The complete cycle is said to be less than 5 seconds.

Fig. 5, at right, a Colonial broaching machine provided with an ejector conveyor to remove the broached parts. An automatic loader, not clearly shown, is synchronized with the unloader. Photo by courtesy of Colonial Broach Co., Detroit.







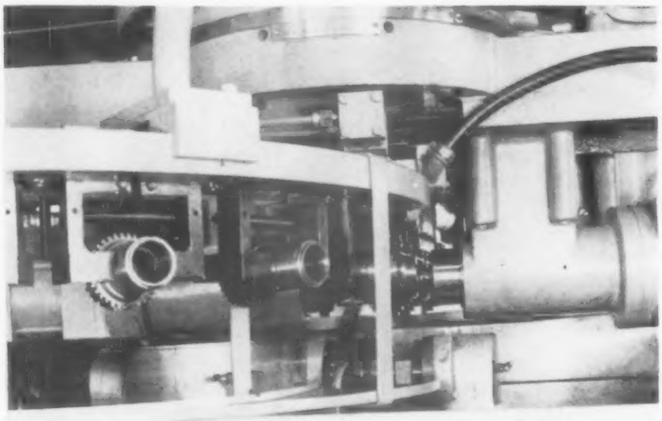


Fig. 6, at left, automatic loading of gears in a dual-head honing machine. The gears, descending in two chutes, drop into shutter fixtures which, after honing, retract for discharge and reloading. Photo by courtesy of Micromatic Hone Corporation, Detroit.

Fig. 7, at right, a highly coordinated system for automatic feeding of gears through one or several machines, by Michigan Tool Company, Detroit. As applied to a Michigan No. 870 gear shaving machine, the gears are loaded into work holders on a conveyor which passes right through the machine.

When finishing cluster gears, the conveyor passes through as many machines as there are gears on the cluster, all gears being shaved simultaneously once conveyor has carried the first-in-line to the last work station. After shaving, the gears are automatically released from the work holders.

celerated by use of dual feed chutes.

Automatic feeding and unloading on a considerably broader scale is shown in Fig. 7, where gears loaded on a conveyor pass entirely through one or several gear finishing machines. In the case of clusters, all gears on the cluster are finished simultaneously once the first gear in line reaches the final work stations.

On all types of magazine feeds, the following elements of design must be given careful consideration:

1. When feeding cylindrical parts, care must be taken to restrain the next-in-line to prevent shifting or "leapfrogging" when feeding the preceding part into the work station.

2. The magazine or supply chute must be conveniently accessible to the operator, for quick replenishing; especially so if the magazine holds but a limited number of parts.

3. When feeding stacked flat parts from the bottom, the total weight of the stack must not be so great as to restrict free action of the pusher during feed stroke and retraction.

4. All related mechanisms must be accurately synchronized, either mechanically or by means of pneumatic, hydraulic or electrical controls, or combinations of any or all of these. This is particularly important when several elements are incorporated in involved designs.

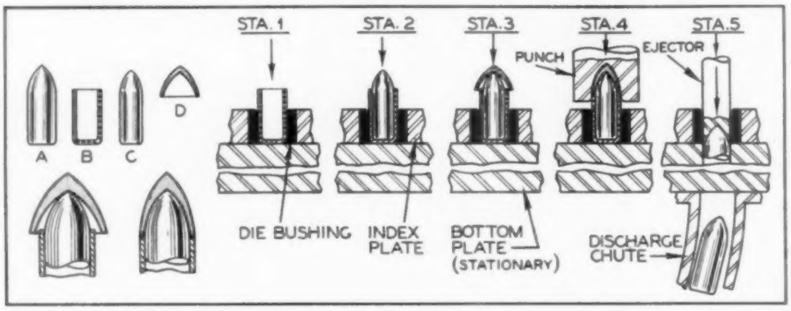
Hopper Feeds

As compared with large, storage-type industrial hoppers, hoppers for selective parts feeding are usually self-contained small units designed to feed small parts—screws, rivets, slugs, shells, washers—which may be loaded in sizeable accumulations and selectively discharged to a work station.

Among the simplest of these, and highly favored by the screw industry because of its large capacity and fast feed rate, is the so-called "centerboard" or blade-type hopper shown in Fig. 8. Practically non-jamming, it is particularly appli-

Fig. 8 at left, a "centerboard" hopper, by Feedall Machine and Engineering Co., Willoughby, Ohio. At bottom of stroke, parts collect in the slotted blade and discharge by gravity at top of stroke. Feedall also manufactures drum-type hoppers.

Fig. 9, at right, a drum-type hopper manufactured by Detroit Power Screwdriver Co. This type is highly selective and, by using several units, various components may be fed and positioned in order of assembly.



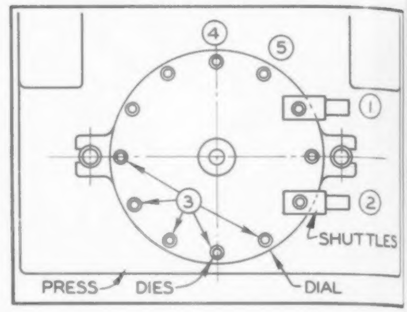


Fig. 10, at left, a jacketed bullet—A—and sequence of assembly. B, C, and D show a cupro-nickel shell, a hardened steel core, and a copper nose in order of assembly. E and F are enlarged views of the several components before and after crimping.
At Station 1—see also Fig. 11, at right—the shell is shuttled into the die; at 2, the core drops into the shell; at 3, the nose is placed on the core; at 4, the components are crimped; and at 5, ejected into a discharge chute. Both shell and core are hopper fed; the nose positioned manually.

cable to feeding cold-headed blanks to thread cutting and rolling machines; also, for feeding headless slugs and U-shaped parts.

Closely approaching the "universal", as far as selective feeding of small parts of widely diversified shapes is concerned, is the drum-type hopper of which a standard unit is shown in Fig. 9. Motor driven and entirely self-contained, and designed for precise selectivity, these hoppers are particularly suited to assembly of small components inasmuch as several units may be grouped to feed parts in sequence of assembly.

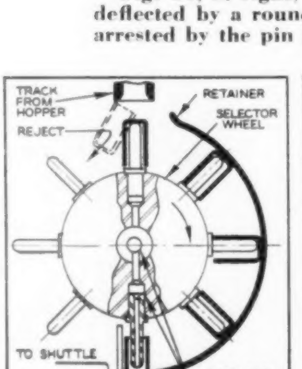
An interesting application of hopper feeding, shown in Figs. 10, 11, 12, 13 and 14, involves assembly of a jacketed bullet comprising three elements: a cupro-nickel shell; a hardened steel core; and a copper nose. Because the tooling—here shown with a punch press dial feed—is patly applicable to many small-parts assemblies and will therefore serve as a case study, it will be described in some detail. The dial feed, Fig. 11, is a standard unit.

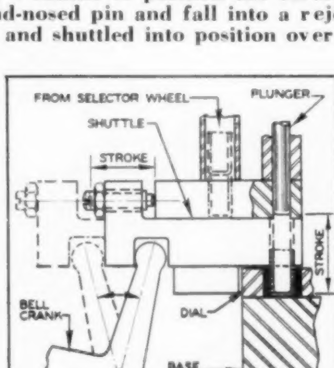
Referring to Fig. 10, the assembled bullet is designated by A, with B, C, and D indicating the shell, core and nose in order or assembly. As indicated in the enlarged views—E and F—the nose is smoothly planished over the shell, with the core a tight fit between the two. Sequence of assembly—see also Fig. 11—is as follows: At Station 1, insert shell in the die; at Sta. 2, insert core in the shell; at 3, manually position the nose on the core; at 4, crimp components; and at 5, eject into discharge chute.

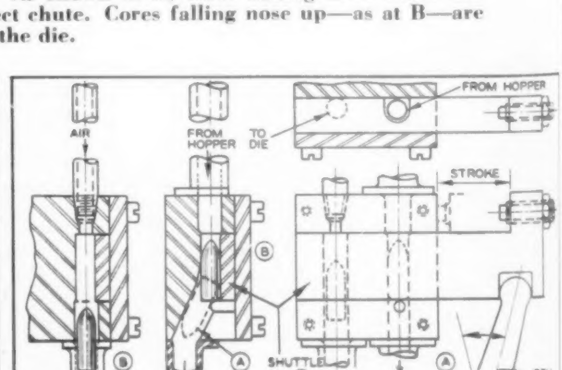
Fig. 12, at left, a selector for shells which, falling head up over the pins, are carried to a chute and then blown by air blast into a shuttle. Shells falling head down drop off at next index of the wheel. The pins are hollow, valving being effected by an outlet hole in the wheel shaft.

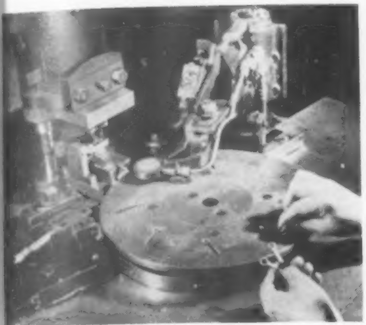
Fig. 13, center, the shuttle which carries the shells coming from the selector wheel to the die. A plunger pushes them into the die at each index.

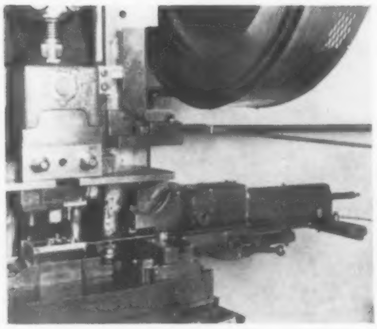
Fig. 14, at right, a shuttle to position the cores. As shown at A, cores falling nose down are deflected by a round-nosed pin and fall into a reject chute. Cores falling nose up—as at B—are arrested by the pin and shuttled into position over the die.











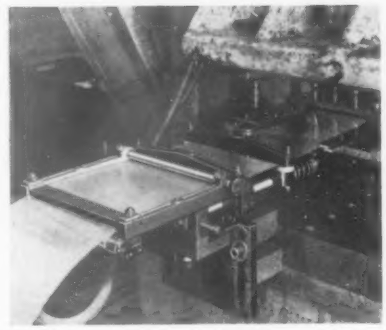


Fig. 15, at left, the Feed-O-Matic, by the V & O Press Co., Hudson, N. Y. Designed for secondary die operations, it employs a mechanical "hand" or vacuum pick-up to transfer parts from a nesting plate to the die. When the hand returns for the next part it trips the press and the finished part is ejected.

Fig. 16, center, the Rol-Die-Feed, by H. E. Dickerman Mfg. Co., Springfield, Mass. This feed handles stock up to 3/16 in. thick in weights up to 2 lbs. per lineal foot. Particularly suited to feeding deep drawing or forming dies, this cam-driven feeder provides 9 in. feed length on a 3 in. stroke press.

Fig. 17, at right, the Feedmaster automatic air feed, by Great Western Tools, Inc., Burbank, Calif. Applicable to punch presses and other machines, it is designed to feed coiled or strip stock up to 18 in. wide x 12 in. stroke. All movements are air-actuated. A feed head pulls the stock into the machine, and a hold head retains it on return stroke of the feeder. All of these feeders are designed for fast operation.

While the nose could be hopper fed, the method would be somewhat involved; anyway, there would be no appreciable advantage since the operator can easily place it on the core between indexing. The dial should accelerate and decelerate slowly lest the nose fall off due to sudden starts and stops.

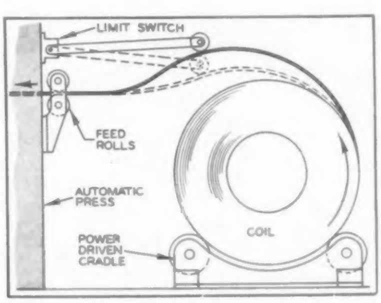
Figs. 12, 13 and 14 show, in that order, a selector wheel for positioning the shells; a shuttle for feeding the core. To avoid confusing details, the indexing mechanism is not shown; however, it can be conventional design. Two drum-type hoppers are used; one each for the shell and core.

Punch Press Feeds

Press feeders may be roughly divided into four groups: magazine feeds; transfer devices, used for secondary operations; push or pull straight-line; and roll feeds. The magazine feed shown at right, Fig. 2, would serve for feeding blanks. Shown in Fig. 15 is a standard press feeder for secondary press operations, and in Figs. 16 and 17 standard units for feeding strip stock. A special roll-type feed, Fig. 18, follows more or less conventional roll feed design the while incorporating several novel refinements.

To a considerable extent, the capacity of feeds such as shown in Figs. 16, 17 and 18 is limited by the weight or drag of the stock, especially so when feeding heavy stock from large coils. Too great a weight, or too heavy a pull, may cause slippage and thereby impair register. In such case, one unwinds the coil on a power-driven cradle, such as suggested by Fig. 19. A limit switch controls the rate of unwind and imposes no undue strain on the press feeder itself.

Fig. 18, at left, a double-action press equipped with a special pull-type roll feeder designed for precision feeding of strip stock. Fig. 19, at right, a schematic diagram of a power-driven cradle for breeding large, heavy coils. Should the strip "balloon", a limit switch cuts off power and resumes feed at low limit. With such units, the press feeder—roll, push or pull—is relieved of all strain except that required to move the stock through the dies. Units of this type are particularly applicable to automatic presses.



Feeding Large Sheets

Whereas these feeders serve admirably for strip stock, one contends with an entirely different problem when feeding large sheets. Here, feeding from the top is mandatory and involves rather nice selection since, in the case of thin sheets, a pawl or finger may slip off the top sheet.

The problem is further complicated by the fact that, should the

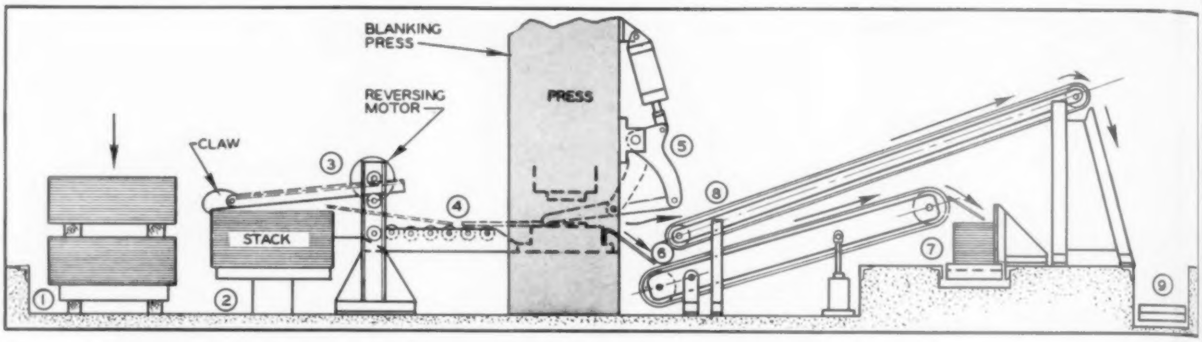


Fig. 20, a schematic layout showing feeding and handling of large sheets to a blanking press. Reserve is crane-lifted to the pallet 1, then to hydraulic lift 2 when stack is exhausted. The lift, manually controlled by a valve, is raised periodically to maintain top of stack slightly over die level for straight-line feeding. The feeder, 3, which carries a weighted claw, is here shown actuated by rack and pinion with a reversing motor as the power source. However, an air or hydraulic cylinder could be used. The feeder pulls a sheet onto the bascule roller conveyor, 4, as the last blank is cut from the preceding sheet.

The blanks are automatically removed from the die, on up-stroke, by the unloader 5, and drop to conveyor belt 6, thence to flush-with-floor roller conveyor 7. The operators throw the scrap onto conveyor 8 which—barring intervening cutting-up—carries it to under-floor scrap conveyor 9. The unloader is actuated by a cylinder controlled by an over-riding cam—not shown—tripping a valve on the press column. The bascule conveyor can be folded up to provide working room for die setters.

sheets have a slight film of oil, surface cohesion would entail considerable initial pull to break it loose from the stack. One can overcome that by a suction lift, such as suggested by Fig. 24.

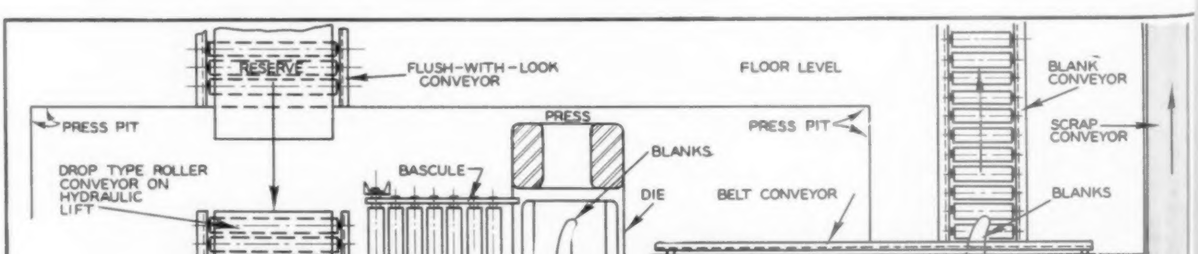
Shown in Fig. 20 is a layout for semi-automatic feeding of large sheets to a blanking press, and method of unloading the blanks and disposing of scrap. Reserve supply is crane-lifed to a pallet, thence to the stack as the latter is depleted. The top of the stack is maintained slightly above die level by means of a hydraulic lift, and a mechanical "hand" pulls the top sheet to a bascule conveyor, from which the operators pass the sheet to the die as soon as the last blank is cut from the preceding sheet.

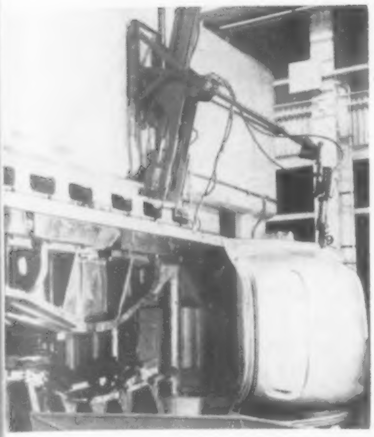
The blanks, emerging from the opposite side of the press, are removed by a mechanical unloader, picked up by the operators and thrown onto a belt conveyor which stacks them on a flush-with-floor roller conveyor. Between strokes, they throw the scrap onto a second conveyor which dumps it into a sub-floor scrap conveyor.

Shown in Fig. 21 is a partial floor plan suggesting an alternate to the crane lift from reserve to stack. The reserve is crane-lifted to a flush-with-floor roller conveyor, whence it can be pushed directly onto the hydraulic lift without endangering the operators. Other conveyors provide for removal of the blanks, the whole denoting "good housekeeping". A press unloader of novel design, and suited to large stampings, is shown in Fig. 22.

It may be explained, here, that the sheet handling system described does

Fig. 21, a partial floor plan of the press layout shown in Fig. 5. Here, the reserve is crane-spotted onto a flush-with-floor roller conveyor at main floor level and directly in line with the hydraulic lift. When the stack on the latter is depleted, the lift is lowered level with or slightly below the floor conveyor and the reserve pushed straight on. No crane lift involved. The rollers on the hydraulic lift retract after loading, to present a non-slip surface for the stack. At right, in the layout, are shown the blank and scrap conveyors. Note: "Flush-with-look", in illustration, should read: *Flush-with floor*.





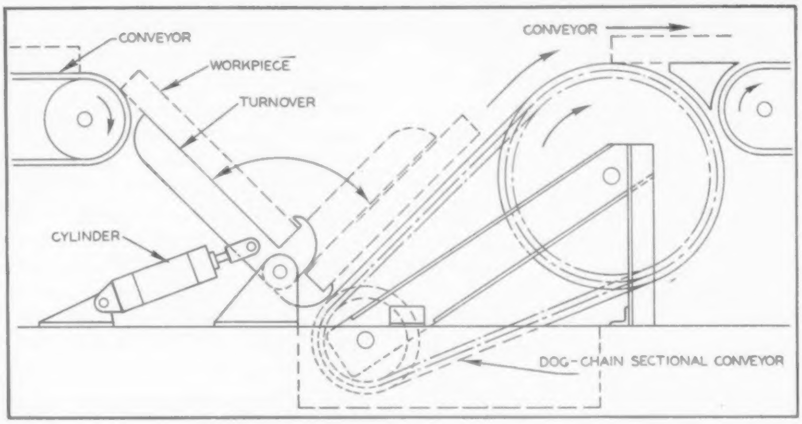


Fig. 22, at left, the "Iron Hand" manufactured by Sahlin Engineering Co., Birmingham, Mich., here shown removing a roof panel from a forming press. So far available only for unloading, it is nevertheless a cost saver and an auxiliary and applicable to automatic loading and unloading systems.

Fig. 23, at right, a diagram of a simple turnover, used with a conveyor, by which sheets or assemblies fall by gravity onto a "flipper" which inverts them onto an opposite conveyor. The flipper is actuated by a cylinder controlled by trigger switch through a solenoid valve.

not reduce the number of operators, two being required for feeding and two for disposing of blanks and scrap. Considering, however, that large sheets may weigh upward of 500 lbs., one can readily apperciate the reduction in operator fatigue; in addition, there is less hazard from crane lifts, with incidental work stoppages, and considerably increased output as a result of mechanical handling.

Sometimes, it is desirable to invert sheets or assemblies while traveling on a conveyor. The simple turnover shown in Fig. 23 is applicable both to sheets and certain types of pressed steel or other assemblies. Another turnover, shown in Fig. 24, employs suction cups to pick up and invert fragile sheets, such as glass. Suction cups of the type shown may also be used to break surface cohesion between stacked sheets.

Transfer Machines

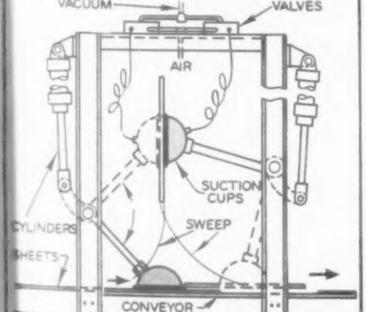
As the name implies, transfer machines move parts in process from station to station, with a separate and distinct operation performed at each. Usually designed for large parts, such as transmission cases, axles, crankshafts and so on, they are necessarily engineered for the job and may range from a comparatively small unit of a few stations to complete plant layouts involving one or several large units, each comprising as many separate machines as there are operations to be performed.

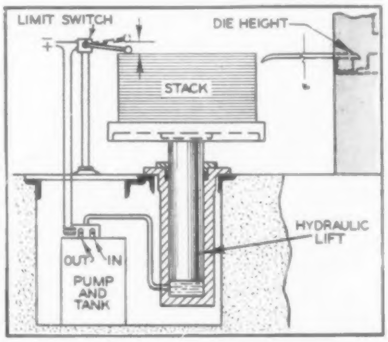
Thus, a transfer machine may drill all of the holes on from one to three sides of a cylinder block, then, after inverting the part at a turnover station, drill the balance of the holes on the fourth side—or, in case of interferences on the preceding unit, other holes on one or both of the sides now exposed.

While transfer machines are manufactured by several of the machine tool builders, the machine illustrated

Fig. 24, at left, a diagram of a vacuum-type turnover for flat stock. At a predetermined spot along the conveyor, one suction cup lifts the sheet to horizontal position, when the opposite cup engages the sheet and applies suction. Simultaneously, vacuum in the first cup is released. The second cup then deposits the sheet, inverted, onto the conveyor. This type of turnover is particularly suited to fragile materials, such as glass sheets.

Fig. 25, at right, a diagram of a hydraulic lift such as suggested in Fig. 20. Top of stack is held at comparative die level by a solenoid valve actuated by a limit switch. The cylinder lowers by its own weight and vacuum created by discharge. A remote control switch, not shown, raises or lowers the lift independently of the limit switch. These lifts are commercially available in standard units.





in Fig. 25 embodies the general principles and may be considered typical of transfer machines in general.

While the various types of automatic and semi-automatic feeds described and illustrated are mainly confined to specific materials or parts, many are nevertheless "convertible" to applications beyond those for which they were originally designed. Thus, bar stock feeds may be used for automatic loading of swaging machines, centerless grinders and other machine tools; also, for the general run of magazine feeds designed for cylindrical parts.

Hopper feeds, which are by far the most versatile, have almost unlimited applications and may be integrated with about every type of equipment from rivet feeding and clinching machines through highly selective automatic inspection machines. Nor need they necessarily be confined to feeding small parts, as previously intimated in this report; rather, the principle of design can well be incorporated for handling a variety of larger parts. Nor are hoppers confined to handling machine parts; rather, hopper feeds are used in flour mills, bakeries, rubber and chemical plants for precise blending of compounds.

As a general rule, standard equipment should be given preference over special designs. It is usually cheaper in first cost, permits replacement of parts from manufacturer's stock, and has the further advantage of being salvable—for that matter, many stock feeds are specifically designed for quick transfer from one machine to another. Inversely, it were poor economy to use standard equipment if special-purpose appliances promise greater output with reduced manufacturing costs; then, the special design warrants serious consideration on the part of the tool engineer or production executive.

Materials Handling

In connection with mechanical stock feeding, there is one point that cannot be too strongly stressed —that is, that it be integrated with plant layout and materials handling. True, a transfer-type machine may imply a complete plant layout in itself; particularly so if several machines are combined to complete a part in the one pass. Even then, thought must be directed toward moving the work to and from the machine. For no matter how ingeniously a machine may be engineered, its potentials may be entirely cancelled out by inadequate materials handling.

Here, of course, the materials handling industry provides a wide choice of equipment—conveyors, cranes, power hoists, motorized trucks—and any one or all of them may be used for transport of material, depending on the size of the plant or diversity of product. All of these elements must be integrated for maximum economy in manufacture.

The problem becomes particularly acute in plants manufacturing pressed metal assemblies where large presses may be so located, in adjacent pits, that room for installation of automatic stock feeding appliances is at a premium. Here crane lifts may be considered a necessary evil that portends hazard to operators and periodic work stoppages; however, even such difficult situations may be improved by installation of parallel-with-press roller conveyors, as suggested in Figs. 20 and 21.

Another Tool Engineering Report will appear in March issue The Tool Engineer.

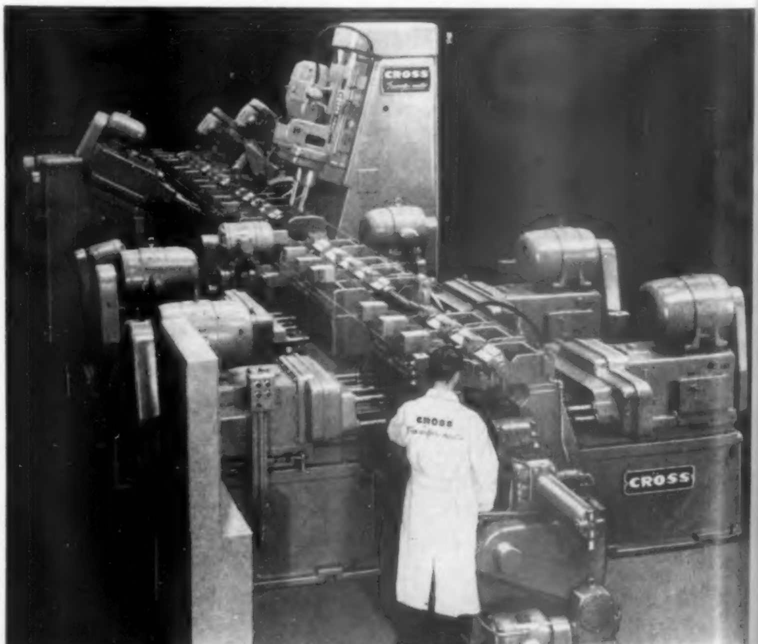


Fig. 26, a Transfer-matic, built by Cross Company, Detroit, for drilling, chamfering, reaming and tapping 32 holes in the ends, sides and tops of automotive transmission cases. Operations are performed at 28 stations, including loading, unloading and an intermediate indexing station. The parts move automatically from station to station, with output stated as about 85 per hour with one operator.

In line with general practice in transfer machine design, units are standard and mounted on a specially designed base. An unusual feature of the machine illustrated is a tool control system—not shown, since it is remotely disposed—which automatically stops the machine when any tool requires changing. Actually, the machine stops before the tools wear beyond the point of economical sharpening, the control board indicating the station or stations involved. The dull tool is immediately replaced by a spare.

New York Program To Boost Defense Work, Job Training

March Convention Speakers Stress Higher Speeds, Lower Costs, New Materials

MAYBE YOU'VE never attended a national meeting of your Society. Too busy, too far away, too—indifferent? But you can't afford to miss the next one, at Hotel New Yorker, New York, March 14-17.

You owe it to your country, your profession and yourself to learn the latest production techniques. Thirty-seven speakers will bring them to you in 28 sessions. It's the biggest technical seminar ASTE has ever presented.

As the emergency program quickens, tool engineers will be called upon not only to make wheels turn faster, but also to design foolproof and automatic machines that can be manned by unskilled workers.

Speaking unofficially before a mobilization meeting of engineering company executives in Detroit, H. L. Tigges, ASTE president recently named machine tool consultant to the National Production Authority, said, "Technical societies are one of the best sources of information about the fields they represent. They have knowledge essential to integrating a given industry into the overall effort, or for disclosing weak points in the American industrial front."

ASTE is giving you this know-how in what will be one of the major events of the year in engineering circles.

Starting Thursday morning, the 15th, Francis W. Boulger, supervising metallurgist, Battelle Memorial Institute, Columbus, Ohio, will report studies of "*Machinability Measurement on Constant-Pressure Lathes.*"

When laboratory tests simulate actual practice, machinability ratings obtained with constant-pressure lathes agree with commercial experience. Using these lathes, accurate measurements can be quickly made on small specimens.

Bars from the same heat of steel, even specimens from the same ingot, vary in cutting quality, Mr. Boulger finds. So care must be exercised in using machinability ratings as a guide to optimum cutting conditions for a lot.

In a joint paper on "*Hobs and Hob-*

Top: A new multiple spindle profiling machine, designed to mill irregularly shaped parts, can turn out four pieces simultaneously. American Machine & Foundry Co. installed it to replace four different machines. Left: Built and used for Mack Research Division, this machine evaluates resistance of various materials to heat checking, reproducing operating conditions in a brake drum. Right: ASTE convention registrants may be among the half-million annual visitors to the RCA observation roof in Rockefeller Center. Here the "Queen Mary" steams up the Hudson between the Manhattan and Jersey shores.

bing in High Production," Don Moncrieff, assistant chief engineer, and Harry Pelphrey, research engineer, Michigan Tool Co., Detroit, will attempt to prove or disprove unestablished theories. They will deal with multiple-thread hobs, chip loads, when to make one cut, or two; hob care, hob shifting mechanisms, and what form to use in prefinishing for shaving or grinding.

Two other talks are scheduled in the first session period. They are: *What the Tool Engineer Should Know About Silicones*" and "*Optimum Use of Mechanical Presses.*"

Includes Four Symposia

The first of four symposia is billed for Thursday afternoon. It is "*Non-Destructive Testing and Inspection.*" Francis G. Tatnall, manager of testing research, Baldwin Locomotive Works, Philadelphia, will lead off with "*Applications of Bonded Wire Strain Gages.*"

After outlining the principle and instrumentation of these gages, he will show schematic diagrams of the five basic circuits in which the gage is used commercially.

Mr. Tatnall will continue with a description of devices applicable to production work. Going on to applications, he will explain dynamic uses of this gage in industry, how to build it into existing equipment, and possibilities for telemetering and commutating.

"*Ultrasonic Inspection Today*" is the phase H. E. Van Valkenburg, engineering department, Sperry Products, Inc., Danbury, Conn., will present. Mr. Van Valkenburg will delve into unexplored potentialities of this testing method and discuss limitations determined by theory and experience. He will describe commercially used instruments and their application to practical problems of inspection.

Do you know how and why to use "*Production Plunge-Cut Grinding*" in finishing cylindrical parts? If not, Frank W. Curtis, chief engineer, Machine Tool Div., Van Norman Co., Springfield, Mass., has the answers in his paper, on benefits and drawbacks of this method.

Do Two Operations at Once

"Plunge grinding," Mr. Curtis states, "can be used for simultaneously finishing diameters and shoulders, with single or multiple wheels, or on grinding machines equipped with multiple wheelheads."

Factors to be analyzed include angle of approach for the wheelhead, differential in peripheral speed of the grinding wheels, wheel dressing, use of gaging and sizing devices, function of spark-out in relation to finished tolerance, and how parts design can be modified to fully utilize this grinding method.

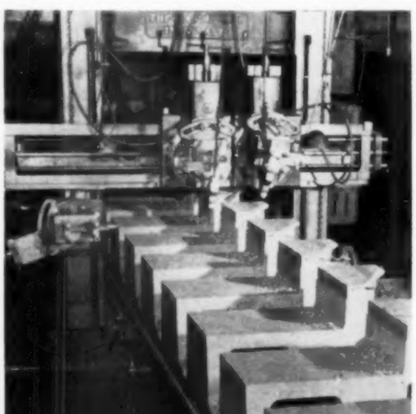
Concurrent sessions will be concerned with "*Production Evaluation of Cutting Tool Materials,*" "*Inert-Gas-Shielded Arc Welding as a Manufacturing Method,*" and "*Lubricant Practice in the Forming of Metals.*"

Old meets new at West 53rd Street where the Museum of Modern Art crowds neighboring brownstone fronts.

What everybody wants to know "*Raising the Limits on Machining Speeds,*" is the evening symposium topic. W. R. Frazer, chief metallurgist, Union Twist Drill Co., Athol, Mass., will cover the *high speed steel* angle. Citing case histories, he will show how more pieces per hour or per grind have been obtained with some of the new high alloy, high speed steels.

The *carbide machining* aspects, to be discussed by W. P. Coomey of Ri... Barton Corp., Worcester, Mass., were briefed in the December *Tool Engineer*.

If greater efficiency in "*Plant Layout for Precision Manufacturing*" is you...



Left, top: In this gang planing operation at American Machine & Foundry Co., the surfaces of cigarette maker bases are finished in one setting. Bottom: Along a Mack Truck production line, crankshaft throws are ground on the outside. Below: Busts in the colonnade of New York University's Hall of Fame commemorate famous Americans.

problem, George A. Richroath, manufacturing engineer, Sperry Gyroscope Co., Great Neck, L. I., can help you. He will advocate the colony-type machine shop, following up with optimum machine arrangement, an unusual setup for tool crib operation, unique tool room and sheet metal shop layouts.

Also on the Thursday evening program are "*Inspection by Optical Projection Methods*" and "*Tooling Up for Metallizing.*"

How to Analyze Gear Factors

"*What Do You Need from Gears?*" Prof. Earle Buckingham, mechanical engineering department, Massachusetts Institute of Technology, Cambridge, can tell you how to get it. He speaks Friday morning.

If static strength is the important factor, refinements of accuracy are not needed. If positioning is paramount, concentricity is the major consideration. Where high speed transmission of power is involved, accuracy of tooth form and spacing are essential.

"The best gear, in any case," says Professor Buckingham, "is the cheapest one that will give full satisfaction."

Experience of one of the "big three" in "*Administration of Quality Control*" is behind the story to be told by George J. Scranton, manager of standards and methods department, quality control manufacturing staff, Ford Motor Co., Dearborn, Mich.

"Operators take greater pride in their workmanship," Mr. Scranton points out, "when they know that improved quality is the rule of every department of their company. In operations as big as ours, savings run into millions. But quality control is just as important for smaller manufacturers."

Mr. Scranton will reveal how this auto builder licked its problems and what it plans for the future.

Other morning meetings will take up: "*Criteria for Selecting Production Milling Methods,*" "*Non-Concentric Automatic Transfer Pressworking,*" and "*Manufacturing Applications of Liquid Impact Blasting.*"

Three Ways to Reduce Vibration

"*Machine Tool Mounting for Vibration Dampening*" will bring experts in three fields to the platform Friday afternoon.

Donald H. Vance, assistant general manager and executive engineer, The Korfund Co., Long Island City, N. Y., will concentrate on "*Steel Spring-Type Mountings.*" Applications he will describe range from 10 to 50,000 lb capacity per mounting. Steel spring isolated machine tools include such installations as a 50-ton naval gun turret gear cutter over 33 ft in diameter.

Next comes "*Reduction of Vibration, Sound and Shock Transmission with Rubber Mounts*" by Arnold Pfenninger, Jr., chief engineer, The Connecticut Hard Rubber Co., New Haven.

Slides will illustrate physical considerations, commonly used types of rubber mountings, and how to determine mounting requirements under given

Right, top: Patchin Place in New York's Greenwich Village is one of the quiet byways in a teeming metropolis. Center: A workman at DeJur Amsco Corp. grinds constant diameter cams made from graphite impregnated phenolic material, to within 0.0003 in. OD, using a 10:1 master cam. The parts are used in motion picture projectors. Bottom: Light meters are calibrated by means of a constant light source of standard levels of color, temperature and illumination, varied through a method of waterhouse stops. The magnetic circuit is then adjusted to this standard of illumination by recognized a-c field stabilization. Below: The "Little Church Around the Corner" is a favorite with the theatrical profession. Thousands of weddings are performed each year before the Bride's Altar.

conditions. Mr. Pfenninger will also describe physical properties of natural and synthetic rubber components considered in the design application of Fiberglas isolaters and shock mounts.

The third method, "*Felt Mountings*," will be handled by G. W. Eldridge, manager of Unisorb department, The Felters Co., Boston, Mass.

Papers will also be read on: "*Automatic Control of Machine Tools*," "*Economic Possibilities in Tumble Finishing*," and "*Tooling for Multiple Slide Presses*."

Friday evening there will be time out for the annual meeting and banquet.

The intensive technical program will end Saturday morning with: "*Multi-Cylinder Hydraulic Presses and Controls*," "*Measuring and Interpreting the Factors in Tapping Torques*," "*Continuous and Automatic Gaging*," and "*High-Production Abrasive Belt Finishing*."

These are in addition to papers outlined in the December issue.

Business Precedes Lectures

So that everyone will be free to hear these important technical talks, the board of directors and house of delegates will meet Wednesday, the 14th. Look for an announcement next month of an outstanding contribution to the national emergency, to be presented that evening.

THE MOUNTING MOMENTUM of defense production and leveling off of civilian manufacturing will be felt in the busy metal working plants to be visited. Already there is a shortage of open machine time in the New York metropolitan area.

At the American Machine & Foundry Co. plant in Brooklyn, you can see unusual setups for heavy machining. Cam processing is an important operation in building equipment for manufacturing, wrapping, weighing, and sealing.

To See Cigarettes Made

A novel feature of this tour will be a demonstration of the finished products —complicated machines that are complete manufacturing plants. You can watch one that turns out 1500 cigarettes per minute, another that makes 13 cigars in the same time.

The ingenious mechanical motions in these machines will be explained during the demonstration.

Delicate precision characterizes activities at DeJur Amsco Corp., Long Island City. This company designs and makes its own electronic testing equipment, gages and other inspection devices for checking cameras, projectors, exposure meters, industrial electrical instruments, precision potentiometers, and rheostats.

In a dust-free, air-conditioned room, approximately 100 people assemble 1000 meter units per day on six production lines. Meter calibration and inspection also are carried out in this department, along with testing, gaging, and fitting to close tolerances of small and precise components.

Machining, tool and die making, engineering, model building, and experimental work will be inspected at this plant.

Diesel Engine Testing at Mack

Over in Plainfield, N. J., Mack-International Motor Truck Corp. will show ASTE members how they make gasoline and diesel engines for trucks, buses and fire apparatus. Fabricating and assembly of transmission and rear axle assemblies also are handled in this plant.

One of the most elaborate in the industry, the motor testing room is fitted with new dynamometers and the latest equipment for providing cooled, filtered oil and partial power recovery.

Northern New Jersey chapter members responsible for arranging this and other plant tours in Jersey towns are: Joseph F. Smith, J. F. Smith Co., Newark and N. James Bosted, sales manager, H. W. Mills Co., Passaic, assisted by Albert J. Schmidt, chapter chairman, and H. Wilson Ryno, chapter secretary.

A complete list of plants to be visited appeared in the previous issue.

As relief for the tightly packed engineering program, there will be recreational features. A top-flight floor show has been booked for the annual dinner. And the Host Chapter Committee will have information on tap about sightseeing, entertainment and night clubs.

Tickets for Hit Shows

Arrangements have been made for obtaining tickets for some of the leading theatrical attractions at a nominal fee. For information write at once to the Play of the Month Guild, 545 Fifth Ave., New York 17, N. Y. Application and payment must be received by the Guild by February 1. No tickets are available for South Pacific, Guys and Dolls, or Call Me Madam.

Throughout the Society there is high excitement about the Bermuda cruise to follow the convention. Inquiries are pouring into headquarters from all over the United States and Canada. This promises to be as pleasant a party as previous convention travel groups. See page 52 of the December issue and page 63 of this issue for details.

Swanson Forms Tool Firm

Grand Rapids, Mich.—Harry J. Swanson of Western Michigan chapter, has formed his own machine tool sales firm, Swanson Machinery Co.

Mr. Swanson recently resigned from the E. L. Essley Machinery Co. of Chicago after 10 years' service as district manager in charge of sales in Michigan and Indiana areas.

Other News in This Issue

Chapter listings include member as well as meeting news.

After the New York Convention Is Over

A Bermuda holidaying couple climb to an overhanging terrace for a snack between swims.

A Paradise Worlds Away Beckons in Nearby Bermuda

Widespread Response to First ASTE Cruise

THERE'S A SAYING that the ideal island should be small enough to go around in a day, big enough to live on, little enough to love. And, one might add, near enough to reach quickly, but far enough away to leave care behind. That fits Bermuda, destination of the Society's post-convention cruise from New York, March 17-22.

Only 24 miles long and less than two miles wide, Bermuda can be toured from tip to tip in a single day. Of course you can't explore everything, visit all the historical spots, or participate in every activity.

Houses in Pastel Coral Rock

But you can see how these unhurried islanders live—in homes painted oleander pink, sea green, apricot, and turquoise, or left a sparkling white. House building is simple. With a hand saw, a workman cuts blocks from the coral limestone that forms island peaks of a submerged, prehistoric mountain. Laid up with lime and sand mortar, then cement plastered, the soft rock makes a snug little home.

By moonlight the roofs look snow-covered. Householders are required by law to keep them limewashed. Since there are no streams or springs, most families must catch the rain for their water supply.

Outcurving "hospitality steps" lead up to pleasant old mansions. The present owners don't talk about it, but much of their beautiful French and Spanish furniture came from the West Indies, via the pirating privateers.

Mark Twain and William Dean Howells started the tourist rush. They enthused so much about Bermuda that Americans began flocking in. They've been coming ever since. You can visit Bay House where Twain was a guest of William Allen, the American consul. And hear about the five United States presidents who stayed there and followed the Bermuda custom of planting a tree.

In Paget look for Felicity Hall and the remodeled slave quarters where Hervey Allen wrote "Anthony Adverse."

Don't miss the day's opening of the House of Commons just before sailing time Tuesday. You can spot the Parliament buildings in the center of Hamilton, by the clock tower honoring Queen Victoria's Jubilee.

Promptly at two o'clock the Speaker, in flowing robe and traditional wig, enters the chamber, preceded by the sergeant at arms bearing the mace. Everybody stands until the Speaker takes the chair and the symbol of authority is laid before him. The House is then in session.

In this limited space we can't begin to tell you all the interesting things there are to see. For a quick fill-in refer to the story on Page 52 of the December issue. To make up your own itinerary and to bone up on Bermuda's lusty background, read "Bushell's Picturesque Bermuda Handbook," published by John J. Bushell.

For further information, rates and deck plan of our ship, the *Queen of Bermuda*, write to the ASTE News Editor, *The Tool Engineer*, 10700 Puritan Ave., Detroit 21, Mich. But move fast: reservations should be made this month.

With players like this, deck tennis is fun aboard the "Queen of Bermuda." Right: Gibb's Hill Lighthouse is your landmark on the islands. Roof in foreground is limewashed by law to purify rain water caught for household use.

Nominating Committee Submits 15 Candidates for 1951-52 Directors

Members Vote This Month to Instruct Delegates on Election of Board in March

WHO WILL DIRECT the Society's affairs for the next fiscal year? The men you approve at your chapter meeting this month. It's an important meeting. Be sure to attend. Do your part towards giving your Society good government. We need skilled leadership in the crucial days ahead.

From a slate of 15 men experienced in ASTE and in industry, you may indicate the 10 you prefer. This will guide your chapter delegate in voting at the house of delegates meeting in New York, March 14.

These candidates were selected by the Annual Nominating Committee, recently elected by the current board. Robert B. Douglas, chairman, of Montreal and his committeemen, A. M. Schmit, Robert W. Bayless, Albert J. Schmidt and John M. Speck, met December 2 at Detroit to make up the slate. Mr. Schmit of Toledo is a member of the National Editorial Committee and a former national secretary; Mr. Bayless, Albert J. Schmidt and Mr. Speck, are chairmen of Peoria, Northern New Jersey, and Des Moines chapters, respectively.

To Take Office Next Fall

Herbert L. Tigges of Toledo, incumbent president of the Society and board chairman, automatically becomes a director "from the date of his retirement until the next annual meeting," under the provisions of the constitution. The ten directors elected in March "shall take office at the next succeeding semi-annual meeting and shall hold office for a period of one year."

Other national officers "shall automatically become nominees for directors." These include: J. J. Demuth, first vice-president and incumbent director; H. E. Collins, second vice-president; R. F. Waindle, third vice-president; W. B. McClellan, national secretary; G. A. Goodwin, national treasurer, and W. A. Thomas, assistant secretary-treasurer.

Directors nominated for re-election are: L. B. Bellamy, J. P. Crosby, T. J. Donovan, Jr., E. W. Ernst, B. J. Hazewinkel, A. D. Lewis and F. J. Schmitt. Mr. Douglas and V. H. Ericson of Worcester have withdrawn their names as candidates for re-election. G. A. Rogers of Montreal and J. L. Webster of Northern New Jersey chapter are the only new contenders.

Additional nominees may be presented before February 1 by a special nominating committee composed of "20 or more senior members of the Society entitled to vote."

In a brochure to be distributed to voting members at January chapter meetings, Mr. Douglas's committee has compiled biographical briefs of the candidates. They are as follows:

Incumbent National Officers

J. J. Demuth—First vice-president and incumbent director, ASTE. General superintendent, member of executive committee, Sligo, Inc., St. Louis, Mo. Senior member since 1941. Has served as second vice-chairman, first vice-chairman and chairman, St. Louis chapter; vice-chairman and chairman, National Constitution and By-Laws Committee. Varied experience in executive and responsible industrial positions. Registered Professional Engineer and member of other technical societies.

H. L. Tigges

J. J. Demuth

H. E. Collins

R. F. Waindle

E. W. Ernst

J. P. Crosby

B. J. Hazewinkel

A. D. Lewis

Harold E. Collins—Second vice-president, ASTE. Chief production engineer, Hughes Tool Co., Houston, Texas. Senior member since 1939. Charter member and active in Houston chapter. Former chapter chairman and national director (four terms). Acting in advisory capacity to the Joint Industry Mobilization Group of the machine tool industry. Member of Tool Committee, Army Ordnance Association. Industrial executive and tool engineer. Active in affairs of other technical societies.

Roger F. Waindle—Third vice-president, ASTE. General manager, Industrial Products Div., Elgin National Watch Co., Elgin, Ill. Senior member since 1945 and charter member, Fox River Valley chapter. Active in chapter affairs; past chapter chairman. Former member, National Finance Committee and past national director (one term). Has held responsible industrial executive positions. Active in other technical, social and civic organizations. Registered Professional Engineer; has B.S. degree in Mechanical Engineering.

W. B. McClellan—National secretary (three terms), ASTE. Engineer, Gairing Tool Co., Detroit, Mich. Specializing on adaptation of cutting tools to special machine tool equipment. Senior member since 1935. In addition to serving as chairman of several committees, he has been second vice-chairman, first vice-chairman and chairman of Detroit chapter. Former vice-chairman of National Program Committee; past chairman of National Editorial Committee (two terms). Active in other technical societies.

George A. Goodwin—National treasurer (three terms), ASTE. Chief process engineer, Master Electric Co., Dayton, Ohio. Senior member since 1938. Is charter member, has served on committees and as vice-chairman and chairman of Dayton chapter. National director (one term), past chairman and incumbent member, National Finance Committee. Has held engineering and executive positions since 1910. Member of Advisory Council of Tool Engineering of Sinclair College. Active in other technical and civic organizations.

William A. Thomas—Assistant secretary-treasurer, ASTE. Superintendent, tool engineering, Ford Motor C

of Canada, Ltd., Windsor, Ont. Senior member since 1942. Charter member, former standards committee chairman and chairman, Windsor chapter. Past chairman Data Sheet Sub-Committee. Incumbent member National Standards Committee (four terms) and chairman, Canadian National Standards Sub-Committee (three terms). Active in civic and educational organizations.

Directors Renominated

Leslie **B. Bellamy**—National director (two terms), ASTE. Branch manager, Detroit office, Sterling Grinding Wheel Div., Cleveland Quarries. Senior member since 1939. Has headed chapter committees, is past chairman, Detroit chapter. Past chairman, Data Sheet Sub-Committee; former member, National Editorial Committee; incumbent chairman, National Standards Committee. Long experience with leading automotive company, in tool design and as chief tool research engineer. Member, Engineering Society of Detroit and ASTE representative on Vocational Guidance Committee, ESD. Active in other technical, professional and civic organizations. Registered Professional Engineer.


W. B. McClellan


G. A. Goodwin


W. A. Thomas


L. B. Bellamy


T. J. Donovan, Jr.


F. J. Schmitt


J. L. Webster


G. A. Rogers

Joseph **P. Crosby**—National director (one term), ASTE. Vice-president and sales manager, The Lapointe Machine Tool Co., Hudson, Mass. Senior member since 1941. Has held chapter committee chairmanships, is immediate past chairman, Boston chapter. Wide industrial experience; membership in other trade and professional groups. Registered Professional Engineer. Active in local civic organizations.

Thomas **J. Donovan, Jr.**—National director (four terms), ASTE. Owner Donovan Co., Philadelphia, Pa. Senior member since 1938. One of three organizers, charter member and past chairman, Philadelphia chapter. Active in all chapter affairs. Former member, National Constitution and By-Laws Committee; incumbent member, National Membership Committee. Active member, Philadelphia chapter, ASM; life member, Army Ordnance Association and Franklin Institute. Extensive industrial and executive background. Active in other technical associations.

E. W. Ernst—National director (one term), ASTE. Superintendent, Punching, Tool and Die Div., General Electric Co., Schenectady, N. Y. Senior member since 1938; life member since April, 1950. Past chairman, Schenectady chapter; former chairman, National Standards Committee (three terms). Chairman, Tool Engineers Handbook Committee (seven terms). ASTE representative on several American Standards Association committees. Active in other professional organizations and in civic affairs.

Ben J. Hazewinkel—National director (one term), ASTE. Representative, L. S. Starrett Co., Denver, Colo. Senior member since 1942. Responsible for organization of Denver chapter; served as chapter chairman and delegate. Member, National Membership Committee. Active in local civic and technical organizations. Broad industrial background in tool engineering field.

Arthur D. Lewis—National director (two terms), ASTE. Owner and manager, Art Lewis Production Equipment Co., Glendale, Calif. Senior member since 1942. Has served in numerous chapter capacities culminating in chairmanship, Los Angeles chapter. Former member, National Program Committee. Wide industrial and executive experience. Registered Professional Engineer.

Fred J. Schmitt—National director (one term), ASTE. Director of sales, D. A. Stuart Oil Co., Chicago, Ill. Senior member since 1938. Active in numerous chapter capacities. Former chairman, Chicago chapter, National Program Committee, and House of Delegates. Active in other technical and executive organizations. Has B.S. in Chemical Engineering. Has held varied technical and executive positions.

Additional Nominees

Gerald A. Rogers—Chairman, National Program Committee (one term), ASTE. Sales engineer, Rudel Machinery Co., Ltd., Montreal, Que., Canada. Senior member since 1942. Past program chairman, first vice-chairman, and chairman, Montreal chapter. Was second vice-chairman and first vice-chairman of the National Program Committee before becoming chairman. Wide industrial experience.

John L. Webster—Master mechanic, Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J. Senior member since 1939. Active on committees, delegate (two terms), and past chairman, Northern New Jersey chapter. Former member, National Finance Committee. Has held responsible positions in industry. Active in other technical organizations.

More Than 500 Tour Western Steel Plant

San Francisco, Calif. — Columbia Steel Co. held open house for more than 500 members and friends of Golden Gate chapter in a series of tours through the Pittsburg, Calif. plant, November 15 and 16.

Following dinner in the company cafeteria, groups of visitors inspected the new sheet and tin plate mill. Here the continuous "pickling" line and the five-stand cold reduction mill weighing more than 3500 tons and operating at better than 4000 fpm were running.

After viewing the electrolytic cleaning lines, the annealing bays and the tempering mills, the engineers moved on to the hot-dip tinning and electrolytic lines. Hot-dipping puts a heavy coating on sheets used for some packing processes. Continuous plate with a thinner coating is produced by the electrolytic tinning method.

In the rolling mills, the ASTE party watched 5000-ft rods being turned out at a speed of 50 mph.

Inspection of the open hearth furnaces concluded the tour. Through the use of burned lime, carefully proportioned quantities of pig iron and scrap steel are melted and purified under heat of 3000 deg F.

In view of the tremendous response, three tours had to be arranged to accommodate the overflow crowd.

Book Committee Asks Member Help on New Die Manual

Detroit, Mich.—Another volume in the Society's contribution to technical literature is now in work. It is the "ASTE Manual on Metal-Stamping Dies." The manual will be compiled by Frank W. Wilson, book editor, under supervision of the newly constituted Book Committee, recently authorized by the board of directors.

The ASTE Book Committee meets to start work on a new die manual. From left, seated: F. W. Curtis, E. W. Ernst, chairman; F. W. Wilson, editor; standing, B. C. Brosheer, Gordon Swardenski and Jay Bowen.

First meeting of the committee was held at Detroit, December 8-9, to start planning for the book. Present were: Chairman E. W. Ernst, superintendent, Punching, Tool and Die Div., General Electric Co., Schenectady, N. Y.; Frank W. Curtis, chief engineer, The Van Norman Co., Springfield, Mass.; Ben C. Brosheer, associate editor, *American Machinist*, Chicago, Ill.

Gordon Swardenski, manager of planning and tooling, Caterpillar Tractor Co., East Peoria, Ill.; Jay Bowen, chief engineer and estimator, McReynolds Die & Tool Co., Detroit; Editor Wilson, and Executive Secretary Harry E. Conrad.

Society members and friends in industry who have material they think might be useful are urged to submit it. "Outstanding examples of good die design and application are what we need," Mr. Ernst said. "Especially tricks and 'kinks' which have helped lick problems in actual practice. We want sketches, drawings or prints with a brief explanation of the 'why' and 'how.'"

Please search your files and memories, Mr. Ernest asks, and send the material direct to: Frank W. Wilson, book editor, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

Lee Wins Top Honor In Membership Drive

Long Beach, Calif.—Herbert S. Lee has won first prize in the Long Beach chapter membership drive. During the November 8 meeting at ChuChus in Lynwood, A. D. Lewis, national director from Los Angeles, presented a "Tool Engineers Handbook" to Mr. Lee. It was reward for adding the most members to the chapter since its chartering last spring.

Daniel MacLean and W. B. MacKay, tied for second place, received duplicate awards.

The closely contested campaign was decided in the last week when Mr. Lee brought in four members, boosting his score one point over the second-place contenders.

The presentations were followed by a chalk talk on Drilling and Reaming by Richard J. Conroy of Whitman & Barnes.

Mr. Conroy explained point grindings required for different materials. Blackboard drawings illustrated common drilling problems and solutions.

In the open discussion following his talk, the speaker described various types of bushings and how they could be used to advantage. He also talked about machines for sharpening drills.

Society Officers Present At USAC Ceremonies

Salt Lake City, Utah—ASTE was among educational societies represented at recent inauguration ceremonies for Louis L. Madsen, the eighth president of Utah State Agricultural College, Logan, Utah.

Ben J. Hazewinkel of Denver, a director, represented the national Society. Leslie Seager, chief tool engineer, Eimco Corp., and local chairman, represented Salt Lake City chapter.

Discussion meetings centering around Utah's industrial development included the place of the tool engineer in industry, his professional growth and development, and qualifying and accrediting tool engineering curricula.

A display of students' accomplishments in tool engineering classes was exhibited.

Professor Frederick Preator, a chapter member, is in charge of the tool engineering program at the college under the direction of Dean Jerald E. Christiansen, School of Engineering. Professor G. Merrill Shaw is the chapter education chairman.

Radio Biggest User Of Permanent Magnets

New Haven, Conn.—John R. Hansen, metallurgical engineer for Crucible Steel Company of America, lectured before New Haven chapter recently on "Permanent Magnets." The dinner meeting was held November 9 at Hotel Clark in Derby.

After tracing the history and development of permanent magnets, Mr. Hansen described their many applications. Two-thirds of these magnets, he said, are used in radio speakers. A number of sample magnets were shown and charts were distributed to an audience of approximately 35.

Fred Dawless, technical chairman, introduced the speaker.

Full Mechanization Seen In Bottle Plant Tour

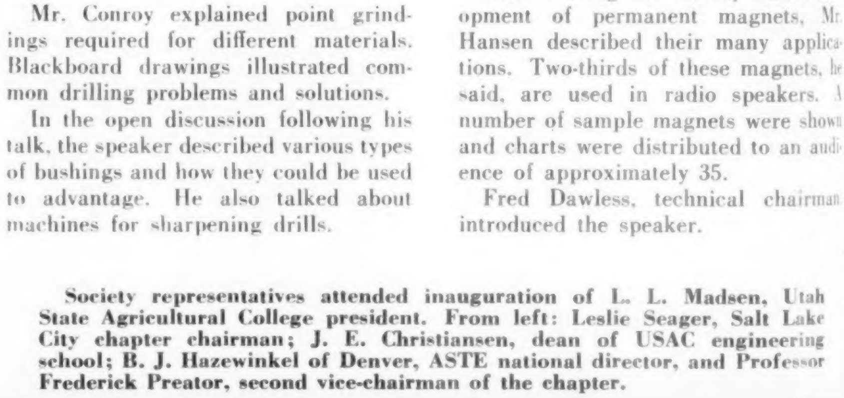
Elmira, N. Y.—A completely automatic, mechanized industry was inspected by approximately 100 Elmira tool engineers, November 6.

Following a dinner meeting at Buddies Restaurant, the chapter group visited the plant of the Thatcher Glass Manufacturing Co.

High production methods used to manufacture bottles were new to most of those in the party. The entire operation, from the mixing of raw materials to the final annealing of the product, eliminates the human element.

Wilfred J. Davies, personnel counselor at Thatcher, arranged the tour.

Society representatives attended inauguration of L. L. Madsen, Utah State Agricultural College president. From left: Leslie Seager, Salt Lake City chapter chairman; J. E. Christiansen, dean of USAC engineering school; B. J. Hazewinkel of Denver, ASTE national director, and Professor Frederick Preator, second vice-chairman of the chapter.



Albuquerque Tool Engineers Hold Organization Meeting

The growing group of tool engineers in Albuquerque, N. M., invite members who have transferred to that area and men who would like to be affiliated with the Society to join them in organizing a chapter. National Director B. J. Hazewinkel of Denver and National Membership Chairman H. B. Osborn of Cleveland attended a recent meeting. Standing, from left: Mr. Hazewinkel, Dr. Osborn, and officers pro tem: J. F. Durrie, chairman; G. F. Heckman, first vice-chairman, and D. B. Kennedy, secretary and treasurer. Dr. Osborn, who is technical director of Tocco Div., Ohio Crankshaft Co., spoke on Induction Heating. Chairman Durrie may be contacted at Sandia Base, Albuquerque, telephone 5-5511, Ext. 222-15.

Automatic Combines Exactness, Short Run Efficiency

Hamilton, Ont.—Through A. C. Wickman of A. C. Wickman (Canada) Ltd., Hamilton chapter is now acquainted with the birthpangs attending the advent of a new machine.

As technical speaker at the November chapter meeting, Mr. Wickman presented a comprehensive study of the work involved in designing and manufacturing the Wickman automatic.

Prime requisites prompting the design of the new machine, according to the speaker, were greater accuracy in machining and ability to produce short runs economically.

The present trend, Mr. Wickman pointed out, is to eliminate time-wasting second operations. To this end, attachments to do slotting, debarring and flat milling are being used more and more extensively on automatics.

The speaker was introduced by Reginald Vincent who announced that recent business arrangements made by Mr. Wickman would locate him in this part of the country. William M. Shaw expressed the chapter's appreciation for his talk.

As the meeting closed a door prize and dinner ticket were drawn, the complimentary dinner going to J. T. Cassell.

A WEEK FOLLOWING the dinner meeting some 150 or more couples enjoyed themselves at the annual fall dance. The Hamilton members, their wives and friends took over the Brant Inn at Burlington to dance to the music of Tim Eaton's orchestra.

Sealed Refrigeration Unit Originated in France

Erie, Pa.—Forty-six members and guests of Erie chapter attended the December 5 ASTE meeting at the General Electric Community Center.

Members from the General Electric Co. Erie Works arranged the program, under the direction of Harold Hagle.

L. W. Atchison, manager of engineering, Household Refrigeration Div., Erie G. E. Works, was the speaker. His subject was "Designing Home Refrigerators and Freezers." In his talk Mr. Atchison reviewed the evolution of mechanical refrigeration design from the original, hermetically sealed unit, made in France in the form of a dumbbell, to present equipment. Of particular interest to the engineers were the many obstacles encountered and how they were overcome.

Among the guests were P. D. Beauvais of the Buffalo-Niagara Frontier chapter and W. K. Goldstrom, a Pittsburgh member. Chairman S. S. Sadoski pres

Griffiths Cites Economy Of Carbide for Dies

Pittsburgh, Pa.—Carbide dies costing six times as much as steel ones have produced from 30 to 40 times as much. Such instances were cited by Edward Griffiths, chairman of the Westinghouse Die Committee, before a meeting of Pittsburgh chapter, held November 3 at the Sheraton Hotel.

In reporting his company's experience with stamping dies and die materials, Mr. Griffiths stressed the importance of analyzing the job before deciding on die materials. The best yardstick in these decisions, he said, is experience gained from past performance.

Seger in New Sales Post

Chicago, Ill.—Hal L. Seger of the Milwaukee ASTE chapter has been appointed manager of drill and reamer sales by Charles H. Besly & Co.

Prior to his promotion Mr. Seger was a drill service engineer for Besly.

Ladies Night Parties Open Holiday Season

Worcester, Mass.—At a dinner meeting, held December 5 at Putnam & Thurston's Restaurant, Worcester members ushered in the holiday season, with their annual Christmas party and ladies night. All business was suspended in favor of entertainment.

Entertainment Chairman Walter Gustafson and his staff provided good music, a fine floor show, and dancing until midnight.

Other Worcester County communities were well represented in the attendance of 140. Each woman guest and most of the members carried home door prizes.

Chapter Chairman Carroll L. Morse presided and introduced from the head table Past President Ray H. Morris of Hartford, Conn., who spoke briefly.

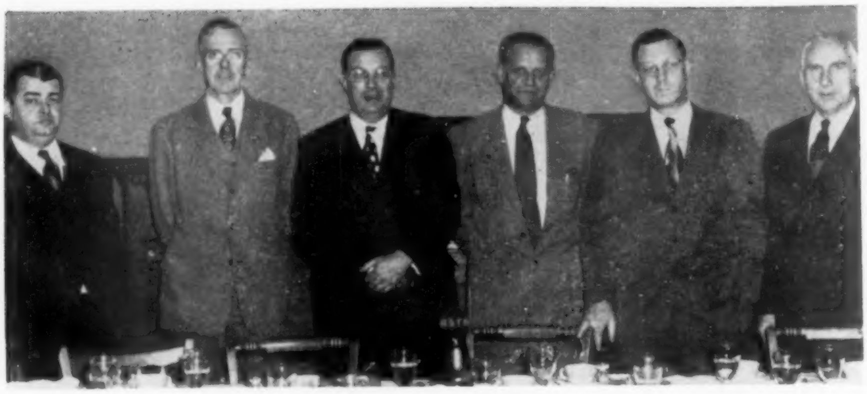
EIGHTY COUPLES turned out December 6 for a gala evening at **Rockford** chapter's ladies night at the Lafayette Hotel. Corsages were presented to the guests of honor.

Following dinner dancing Dr. Robert N. McMurry, personnel and industrial relations expert, spoke on "Is Your Wife a Help or a Hindrance to Your Career?" In his talk the noted psychologist discussed the nine types of wives who handicap a man in his career. George Rigeman, chairman, presided.

Fuerst Promoted by G.E.

Fitchburg, Mass.—Stephen B. Fuerst of Worcester chapter, ASTE, has been appointed supervisor of methods and equipment at the Fitchburg Works of General Electric Co., W. G. Arnold, works manager, has announced.

A graduate of the G.E. Apprentice School, Mr. Fuerst was employed at the Schenectady plant before transferring to Fitchburg in 1942. For the past two years he has assisted the superintendent.



Above: Speakers' table guests at Twin States chapter are, from left: F. J. McArthur, first vice-chairman; W. E. Farrell, a past chairman; H. E. Conrad, ASTE executive secretary, Detroit; V. H. Ericson, national director, Worcester; H. H. Ranney, chapter chairman, and J. B. Johnson, Vermont lieutenant-governor elect and a chapter member. Left: Milton Baker of the Springfield Telephone Co. explains operation of new dial system to a group of members.

Television Transmission Systems Demonstrated

Springfield, Vt.—Speaking before 125 members and guests of Twin States chapter at the Hartness House, November 8, Robert W. Stokes, public relations supervisor for the New England Telephone and Telegraph Co., dramatically demonstrated the principles of television and the telephone's part in making "long distance" television possible. He was assisted by Gordon I. Robertson of his staff.

Sets Up TV Network Model

In his talk, "Expanding Horizons of TV," Mr. Stokes used an imposing array of electronic equipment, recreating a miniature television network on the platform. By means of coaxial cable and radio relay systems, he transmitted speech, music and picture elements across the stage.

Mr. Stokes outlined present television networks and the Bell System's plans for spanning the continent.

In one of the most interesting demonstrations, the speaker operated two miniature radio relay towers. He showed how micro-waves operate like a searchlight beaming speech, music and pictures from point to point. He demonstrated the complete interchangeability between radio relay and coaxial cable by transmitting programs over one and then the other.

Guests from Massachusetts, New Hampshire, Michigan and California included Harry E. Conrad, ASTE executive secretary from Detroit, and V. H. Ericson, national director from Worcester, who spoke on the national Society, between dinner courses. Lieutenant-Governor Elect Joseph B. Johnson, a chapter member, addressed the group concerning state problems.

H. H. Ranney, chapter chairman, introduced nine new members.

F. J. McArthur, program chairman, presented Merrick E. Wheeler, manager of the local telephone company, who in turn introduced the speakers.

Mr. Wheeler later invited the group to see the recent dial installation. Guides explained the operation of the system and problems encountered.

Twenty-seven couples attended a Hallowe'en dinner and dance at the Everay Hotel in Chester, October 27.

C. E. Hoisington of Windsor drew the door prize.

Hartford Host to Ladies

Hartford, Conn.—One of Hartford chapter's most successful ladies nights took place November 17 at the Indian Hill Country Club, Newington.

First Vice-Chairman Robert M. Toppin distributed a multitude of prizes to the women guests, delighting everyone with his informal manner.

After the dinner program, the party continued with dancing.

Among those handling arrangements were: Donald B. Hunting, chapter chairman; Henry E. Kuryla, second vice-chairman; Robert W. Peaslee, A. Douglas Proctor and Mr. Toppin.

Our Society

By Harry E. Conrad

Everyone has made New Year's resolutions by now, I am sure. Our hope is, of course, that we can keep them. I wonder if anyone has made a resolution to "do everything possible to preserve the American Way of Life and to protect our Free Enterprise System."

The time has come when someone must do something about it—someone has to make personal sacrifices and that someone is *all of us!* Too late now to refer the matter to the other fellow; the problem is right in our own laps.

I'm a Republican. I was born one and naturally my point of view has been that the political leadership of our country is very weak. What I think as an individual at a time like this means very little. However, what I do—one way or the other—can either help or hamper. The time is here when we must all help, regardless of our political ideologies. We have a job to do and every last one of us has a part to play.

Our Society, as a highly developed technical organization, can play its part, but even more important—each one of us as an individual must perform to the very best of his ability.

I can assure you that your Society not only stands ready, but is also taking steps toward rendering the best possible service to the cause of maintaining democracy in America.

Mobile Machine Building Viewed at Tractor Plant

Rockford, Ill.—Sixty members of Rockford chapter recently made a trip by chartered bus to the Caterpillar Tractor plant at Peoria.

Upon arrival, the party was greeted by C. O. Wasson of the escort department at Caterpillar, divided into small groups, and started on their tour.

In the morning, they visited the two newest plants to inspect the diesel engine lines and the building of the D4, 7, and 8 tractors.

After lunch in the plant cafeteria the groups were taken through buildings where road construction equipment was being machined and assembled into enormous machines for removing and grading dirt.

At the conclusion of the tour Mr. Wasson briefed the firm's history and answered the engineers' questions.

Several Peoria chapter officers were present at Caterpillar, including Chairman R. W. Bayless who extended greetings to the Rockford ASTE'ers.

On the return trip the bus party stopped at Rock Falls for dinner.

A[illegible]TE-ASME Group Hears T[illegible]lk on Transmissions

[illegible]ayton, Ohio—The local ASTE and A[illegible]ME groups met jointly November 13 at the Engineers Club. The meeting opened with a dinner followed by a technical session.

Oliver F. Kelley, director of transmission development, General Motors Central Engineering, Detroit, addressed the engineers on the subject of automatic transmissions.

Paul Dudas (left) and R. J. Armstrong (right), program chairmen of Dayton chapters, ASME and ASTE, respectively, welcome O. F. Kelley, General Motors speaker, to joint meeting of their groups.

High interest was evident in the number of questions presented during the subsequent discussion period.

The joint meeting idea has become almost an annual affair and is popular with both groups.

Seeds Shows Alloy Uses To Cut Production Costs

San Diego, Calif.—San Diego tool engineers were host to the American Society for Metals and the American Society of Mechanical Engineers, at their November 14 meeting.

Sixty-five members and guests of the three societies heard O. J. Seeds of the Cerro de Pasco Corp. discuss "Industrial Cost Cutting with Cerro Alloys." Applications to reduce costs of tools and fixtures, as well as economical methods in production manufacturing, were illustrated with slides and samples.

Visiting ASTE members included A. D. Lewis, national director; Leslie F. Hawes, former chapter chairman; Anton Peck, chapter delegate, all of Los Angeles, and John Stansbury, Long Beach chapter chairman.

WICHITA, KANS.—Mr. Seeds delivered the same lecture before 70 members and guests attending a dinner meeting of Wichita chapter, November 8, at Wolf's Cafeteria.

[illegible] Noller of the Metal Goods Corp., distributor of Cerro de Pasco products, was a guest of the chapter.

Sees Labor Policies Shaped by World Events

Toronto, Ont.—The many-sided problems involved in management-labor relations, as viewed by top management, were outlined for Toronto members by Neil P. Peterson, president, Canadian Acme Screw & Gear, Ltd., Toronto. Mr. Peterson spoke at the chapter's November 1 dinner meeting in the Oak Room of the Union Station.

In opening his address, "Human Relations in Industry," Mr. Peterson traced tendencies since 1940, pointing out how world events have influenced many labor policies.

The speaker reviewed labor codes introduced by the federal and provincial governments and conducted an interesting discussion period at the close of his talk.

Shows Variations in Millionths

Technical feature was a Brown & Sharpe film, "Precise Electronic Measuring." The motion picture showed the trend toward rigid quality control of both simple and intricate components. Simplicity of adjustment, with the minimum of setup, and magnification capable of revealing variations of four millionths of an inch demonstrated the versatility of the instrument shown.

Chairman John Burk announced the establishment of a $100 scholarship for second-year students majoring in tool design at the School of Mechanical and Industrial Technology, Ryerson Institute. The recipient is to be selected by the institute administration and approved by the education chairman.

Mohawk Valley Exhibits At Area Materials Show

Utica, N. Y.—More than 1100 persons attending the first Remington Arms materials show at Ilion, N. Y., saw a display by Mohawk Valley chapter. ASTE was the only engineering society represented among the working exhibits of leading suppliers to industries in the area.

Sponsored by the Remington Arms Foremen's Association, the one-day show was held November 14 in the employees' clubrooms. Company personnel, members of the Foremen's Association and supervisory groups of other Mohawk Valley industries were invited to view the exhibit.

Fred Barker, chapter chairman, E. K. Wheat, program chairman, and E. A. English, public relations chairman, manned the ASTE booth and explained the Society's aims and services.

The show attracted visitors from Albany, Watertown and Watervliet Arsenal.

Crone Advanced by Ford

Detroit, Mich.—Frank R. Crone, formerly assistant director of production engineering, Lincoln-Mercury Div., Ford Motor Co., has been appointed manager of production engineering, Tractor and Industrial Engine Div. at Highland Park.

An ASTE member since 1932, Mr. Crone has served as national director and national treasurer of the Society. He is affiliated with the Engineering Society of Detroit and the Professional Engineering Society of Michigan.

E. K. Wheat, Fred Barker and E. A. English, Mohawk Valley chapter officers, distributed Society literature to visitors at a materials show sponsored by Remington Arms Foremen's Association.

Tool Engineers of Tomorrow

New York Installs LIATI Student Officers

Leaders of the Long Island Agricultural and Technical Institute ASTE group were sworn in by Karl Kertesz, Greater New York chairman, at a recent student meeting. From left: John Bailey, treasurer; C. C. Rakowski, ASTE faculty representative; Jules Karp, chairman; Mr. Kertesz, John Wilkins, vice-chairman, and Richard Matz, secretary.

New Student Officers Installed at Chicago

Chicago, Ill.—Newly-elected officers of the student section of Chicago chapter were sworn in at a recent meeting. Clare Bryan, a former chairman of the parent group, administered the oath of office to: John M. Duda, chairman; James W. Gibson, first vice-chairman; A. W. Hendon, secretary, and Gordon R. Harris, treasurer.

L. J. Schnitzer of the chapter education committee introduced Richard Stanley, president of Alpha Engineering and Machine Works, and one of his engineers, Bernard Pass, a chapter member.

Mr. Stanley discussed machinery designing and elements an engineer must cope with in this field. A film demonstrated a machine for truing wheels on diesel engines and railway cars, without removing the wheels. After the lecture Mr. Stanley answered questions pertaining to his program.

Toledo Awards Voorhees $200 Scholarship

Toledo, Ohio—John E. Voorhees of Toledo is the winner of this year's $200 scholarship offered by Toledo chapter, R. A. Langenderfer, education chairman, has announced.

The award, made to an outstanding senior engineering student at the University of Toledo, is based on scholastic record, financial need and extra-curricular activities.

Judges, in addition to Mr. Langenderfer, were: Dr. John B. Bradeberry, dean of the university's college of engineering; H. F. Mohney, E. W. Bliss Co.; A. L. Baker, Baker Bros., Inc., and B. H. Sibley, Champion Spark Plug Co.

Nylon Machine Parts Prove Strong, Durable

Utica, N. Y.—How nylon behaves mechanically as a machine component in relation to other plastics and metals was compared for Mohawk Valley members at a chapter meeting held November 28 at the Moose Home.

The speaker was W. C. Wall, development service section, E. I. DuPont de Nemours & Co., Wilmington, Del.

His talk concerned injection molding methods used to produce nylon and plastic gears for food mixers, and other components of specialized machinery.

Slides demonstrated how such parts can be made to very accurate dimensions, eliminating further machining operations. Stress was laid on the strength and wearability of plastic molded parts.

Nylon is becoming increasingly important for machine parts, according to Mr. Wall.

About 45 members and guests attended the technical meeting. Fred Barker, chapter chairman, presided.

Named District Manager

Chicago, Ill.—Henry L. LeMay has been appointed Chicago district manager by the Mid-West Abrasive Co.

Mr. LeMay has transferred to the Chicago ASTE chapter from Los Angeles where he formerly resided.

Reports Observations On Conditions Abroad

Houston, Texas—Hughes Tool Co. was honored at the first industrial night sponsored by Houston chapter. The dinner meeting, attended by 157 members and visitors, was held November 14 at the Ben Milam Hotel. A social hour preceded the dinner.

Just returned from a five-months' European tour, H. E. Collins, manager of the process engineering department at Hughes and second vice-president of ASTE, related his impressions.

While abroad Mr. Collins was headquartered at Dusseldorf, Germany, supervising the manufacturing setup and production of company products at a local plant. He also visited such surrounding countries as Switzerland, France, and the Netherlands. His talk concerned conditions on the Continent and attitudes of Europeans towards Americans and the other Allies.

J. P. Riley of American SIP Corp. tells Houston chapter about Swiss precision machines.

He commented on the progress of the recovery program, and the general feeling of what might be expected from behind the Iron Curtain.

Emphasizing his belief in preparedness, Mr. Collins asserted that we should be better informed of what is going on in Europe and Asia.

J. P. Riley, sales manager for the American SIP Corp., described Swiss machines available in the United States. Mr. Riley stressed the accuracy of these machines and how they are set up to maintain such precision.

Foote Is Sales Manager

Dearborn, Mich. — Appointment of Walter C. Foote as sales manager of Dearborn Gage Co., is announced by Elmer Ellstrom, Jr., partner.

Experienced in both engineering and sales, Mr. Foote will actively direct his company's expansion program. He is a member of the Detroit ASTE chapter

Lengbridge Gives Answers To Press Work Problems

Galt, Ont.—From primary tool design, through press setup, to finished product, 75 members and guests of Grand River Valley chapter followed Deep Drawing of Aluminum as presented by J. W. Lengbridge, project engineer, Aluminum Goods, Ltd., Toronto.

Mr. Lengbridge was the technical speaker at a meeting held November 7 at the Farmers Cooperative Hall in Guelph.

With slides, films and samples he showed solutions of everyday difficulties encountered in press work. A former chairman of Toronto chapter, Mr. Lengbridge is the author of a comprehensive series of articles on aluminum processing published in 1948-49 issues of *The Tool Engineer*.

Charles Spicer introduced the speaker and David McCready thanked him.

William Copp, second vice-chairman, presided in the absence of Harry Whitehall, chairman.

Talks on Process Planning

Flint, Mich.—L. C. Lander, chairman of the industrial engineering department, General Motors Institute, was a recent speaker at Saginaw Valley chapter. Mr. Lander discussed the principles and thought pattern of process planning as they apply in industry.

Sixty-nine members were present for the technical session and preceding smorgasboard dinner at the Zehnder Hotel in Frankenmuth.

Linsley in New Firm

Bridgeport, Conn.—Douglas F. Linsley, formerly vice-president of Metalmold Corp., Derby, is now a partner in Linsley Engineering Co., located at 48 McKinley Ave., Bridgeport.

Mr. Linsley is first vice-chairman of Fairfield County chapter.

QM Officer Suggests Society Initiate Advisory Group

Louisville, Ky.—Citing the urgent need for metal and mechanical groups in all chapters of the Quartermaster Association, a U. S. Army general suggested that the Louisville ASTE chapter inaugurate such a move.

Gen. L. O. Grice

Brig. Gen. L. O. Grice, commanding officer of Jeffersonville QM Depot, made this appeal while addressing the chapter's November dinner meeting, held in the Officers Club at the depot.

Other industrial groups—such as textiles, footwear, food—already are serving in an advisory capacity and cooperating with the Quartermaster Corps, the general said. This gives industry a self-built organization for constant contact with present and future programs and requirements of the QM Corps. With the advice, experience and know-how of manufacturers available, the corps can work out efficient solutions to problems.

Davis Appointed Chairman

The Quartermaster Association is represented locally by the Falls Cities chapter, with a membership of approximately 400 and expectations of doubling this number. It is composed of manufacturers, industrialists, employees of the QM Corps, and military personnel.

The suggestion offered by General Grice was enthusiastically accepted by Louisville ASTE members. Through such cooperation, they feel, tool engineers could accomplish considerable preliminary work towards mobilization.

James R. Davis, a member of the Louisville ASTE chapter and of the Falls Cities chapter of the Quartermaster Association, has been appointed chairman of the metal and mechanical group of the latter organization.

Following the general's talk, films describing the machining and forming of aluminum were shown through the courtesy of the Aluminum Company of America.

Chicago Chapter Entertains Wives at Dinner Dance

Enjoying Chicago chapter's November 10 dinner dance at the Furniture Club are: Frank Martindell (left foreground), a former chairman; H. D. Long (extreme left), first vice-chairman, and M. A. Blu (with glasses), chairman, 1952 exposition committee. During the evening approximately 200 members and their guests played Keno.

Manages New Warehouse

Detroit, Mich.—S. F. Sjogren, vice-president of Columbia Tool Steel Co., Chicago Heights, Ill., has taken charge of the company warehouse building recently completed at 121 Oakman Blvd., Detroit.

The new building, which includes a sales office, is closer to the metal working area than the former warehouse in the downtown section.

Mr. Sjogren is affiliated with the Detroit ASTE chapter.

Coming MEETINGS

ALL CHAPTERS—January. Election of Nominating Committee; consideration of directoral candidates. February. Election of chapter officers, delegates and alternates.

CENTRAL PA.—February 5. Speaker from Clearing Machine Corp. Subject: "Press Working Metals."

CHICAGO—February 13, 8:00 p.m., Western Society of Engineers. Speaker from Argonne National Laboratory, Lemont, Ill. Subject: "Atomic Energy and the Tool Engineer." March 17-21, 1952, Tool Engineers Industrial Exposition.

COLUMBUS—February 14. Speaker: Dr. Paul W. Fitts, professor of psychology, Ohio State University. Subject: "Designing Tools and Indicators for Efficient Human Use."

DETROIT—January 11, Engineering Society of Detroit. Father and Son Night. Dinner 6:15 p.m. February 1, Junior Room. Carbide Series. Subject: "High Production Machining of Steel Parts." February 8. Dinner 6:15 p.m.; technical meeting 8:00 p.m. Subject: "Broaching and Milling."
Student Section Meeting: January 18, Junior Room, 7:00 p.m. Speaker: W. C. Richards, Bellows Co., Akron, Ohio. Subject: "Controlled Air Powers"; 8:00 p.m. Speaker: P. R. Hatch, sales director, Brown & Sharpe Mfg. Co., Providence, R. I. Subject: "Automatic Screw Machines and Tooling Applications."

ERIE—February 6, 6:30 p.m., General Electric Community Center. Speaker: Jack Rebman, product and sales engineer, Lord Mfg. Co. Subject: "Bonded Rubber Products as Applied to Tools."

(FLINT) SAGINAW VALLEY—January 18. Speaker: G. R. Cowing. Subject: "Education and the Tool Engineer"; also Prof. J. N. Edmondson, national education chairman, ASTE. February 15. Subject: "Quality Control."

HARTFORD—January 22, 8:00 p.m., Hartford Gas Co. Auditorium. Sponsored by the Technical Activities Committee. Speaker: N. M. Perris, senior associate, Stevens, Jordan & Harrison, Inc. Subject: "Management Engineering Problems."

NEW HAVEN—January 11, 6:30 p.m., Hotel Garde. Speaker to be announced. Subject: "Vapor Blasting." February 8, 6:30 p.m. Speaker: William B. Retz, New Britain Gridley Co. Subject: "Automatic Screw and Chucking Machines."

(NEWARK) Northern New Jersey—February 13.

NEW YORK, GREATER—March 14-17, Hotel New Yorker. Nineteenth Annual Meeting, ASTE. March 17-22. Post-convention cruise to Bermuda on "Queen of Bermuda." Stay at Princess Hotel, Hamilton, Bermuda.

PHILADELPHIA—January 18. Drilling and Tapping Symposium. February 15, I.T.E. Nite.

(SAN FRANCISCO) GOLDEN GATE—January 17, El Curtola Cafe, Oakland, Calif. Speakers: Robert Neuhaus, Pacific Rustproofing Co., Oakland. Subject: "Zinc Electroplating Methods and the Application of Bright Zinc Deposits and Conversion Coatings." James Tompkins, "Industrial Hard Chrome Plating, Its Advantages and Typical Uses."

(SPRINGFIELD, VT.) TWIN STATES—February 14. Speaker: A. O. Schmidt, Kearney & Trecker Corp. Subject: "Milling by Modern Techniques."

TORONTO—February 7. Speaker: W. L. Sandle, Hayes Steel Products, Ltd. Subject: "Better Methods."

(WASHINGTON, D. C.) POTOMAC—January 11, Dodge Hotel. Speaker: H. L. Strauss, Jr., technical director, National Diamond Laboratory, New York. Subject: "Industrial Diamond Tools." February 8. Speaker: Willis De Boer, vice-president, Engineer Specialties Div., Universal Engraving and Color Plate Co., Buffalo, N. Y. Subject: "Inspection by Optical Projection."

WORCESTER—February 6, Putnam and Thurston's. Subject: "Carbide Symposium."

ASTE News
Continues on page 94

Tool Designer Know-How Needed in Heat Treat

Rochester, N. Y.—The Rochester chapters of ASTE and ASM combined their November meetings in a technical session at the Elks Club, November 13. Approximately 150 members and guests of the two societies were present.

Emmett Moore, ASTE chairman, welcomed the group, including 21 students from Alfred University and Instructors Hornsbeck and Rowe.

Chairman A. J. Larson of ASM introduced the speaker, N. O. Kates, manufacturers service metallurgist with Lindberg Steel Treating Co.

In "Minimizing Heat Treat Headaches" Mr. Kates urged cooperation between tool designer and heat treat department to produce the kind of finished tools desired.

Avoid Special Steels

Successful heat treatment, he said, demands knowledge of the completed tool and its requirements, the radius used on fillets and corners, wall thickness, and uniform machining. Design faults can sometimes be corrected by proper selection of steels. But special steels should be used only when necessary as they invite trouble.

Mr. Kates illustrated with slides the results of incorrect heat treatment. He concluded by comparing the importance of heat treatment of steel in fabricating tools to good engineering in a product.

Is Ordnance Consultant

Chicago, Ill.—George L. Bachner, president of the Powdered Metal Products Corp. of America, has been appointed industrial consultant to the Chief of Ordnance, U.S. Army.

Mr. Bachner will head an advisory committee to pass on the suitability of powdered metal fabrication for specific ordnance requirements.

In his ASTE chapter at Chicago, he is public relations chairman.

Prominent at joint meeting of Rochester chapters, ASTE and ASM, are, from left: A. J. Larson, ASM chairman; N. O. Kates (speaker) of Lindberg Steel Treating Co.; Emmett Moore, ASTE chairman; a Mr. Heil of Heil Grinding Co., and W. W. Wentz, Wallace W. Wentz Machine Tool Co.

Directory of A.S.T.E. Chapter Chairmen

AKRON, NO. 47
Second Monday*
[illegible] W. Kuttler, Jr., *Chm.*, 2371 16th St., Cuyahoga Falls, Ohio

ATLANTA, NO. 61
Third Monday*
J. F. Weideman, *Chm.*, 745 E. Wesley Rd., N.E., Atlanta, Ga.

BALTIMORE, NO. 13
First Wednesday*
R. D. Brickett, *Chm.*, 5310 Grindon Ave., Baltimore 4, Md.

BINGHAMTON, NO. 35
Wed. after 1st Mon.*
G. H. Conine, *Chm.*, 1 Mather St., Apt. 10, Binghamton, N. Y.

BOSTON, NO. 33
Second Thursday*
A. J. Leone, *Chm.*, 6 Trafford St., Quincy, Mass.

BUFFALO-NIAGARA FRONTIER, NO. 10
Second Wednesday*
P. C. Richardson, *Chm.*, 24 West Ave., Newfane, N. Y.

CEDAR RAPIDS, NO. 71
Third Wednesday*
E. H. Wheeler, *Chm.*, 2007 Franklin, N.E., Cedar Rapids, Ia.

CENTRAL PENNA., NO. 22
First Monday
W. W. Faw, *Chm.*, 241 Jefferson Ave., York, Pa.

CHICAGO, NO. 5
Second Tuesday*
T. C. Barber, *Chm.*, Tool Service for Industry, 1809 E. 71st St., Chicago 49, Ill.

CINCINNATI, NO. 21
Second Tuesday*
G. F. Bradley, *Chm.*, 1316 Carolina Ave., Cincinnati 29, O.

CLEVELAND, NO. 3
Second Friday*
H. B. Osborn, Jr., *Chm.*, 3800 Harvard Ave., Cleveland, O.

COLUMBUS, NO. 36
Second Wednesday*
T. F. Starkey, *Chm.*, 323 Chatham Rd., Columbus 2, O.

DAYTON, NO. 18
Second Monday*
C. R. Miller, *Chm.*, 4114 Daleview Ave., Dayton 5, Ohio

DECATUR, NO. 58
Last Tuesday*
F. G. Miller, *Chm.*, 1503 N. Water, Decatur, Ill.

DENVER, NO. 77
First Wednesday*
W. G. Axtell, *Chm.*, 1269 Madison Ave., Denver 6, Colo.

DES MOINES, NO. 80
Third Wednesday*
J. M. Speck, *Chm.*, 1073 28th St., Des Moines 11, Iowa

DETROIT, NO. 1
Second Thursday*
C. M. Smillie, Jr., *Chm.*, 1100 Woodward Hgts. Blvd., Ferndale 20, Mich.

ELMIRA, NO. 24
First Monday*
M. H. Kristensen, *Chm.*, Bird Creek Rd. R.D. 1, Pine City, N.Y.

ERIE, NO. 62
First Tuesday*
S. S. Sadoski, *Chm.*, 520 E. 8th St., Erie, Pa.

EVANSVILLE, NO. 73
Second Monday*
W. V. Stippler, *Chm.*, 816 N. 9th Ave., Evansville 12, Ind.

FAIRFIELD COUNTY, NO. 6
First Wednesday*
T. E. Hogan, *Chm.*, 74 Lenox Ave., Glenbrook, Conn.

FOND DU LAC, NO. 45
Second Friday*
W. H. Jorgensen, *Chm.*, 1132 14th Ave., Green Bay, Wis.

FORT WAYNE, NO. 56
Second Wednesday*
J. L. Brant, *Chm.*, 340 W. Sherwood Terrace, Fort Wayne 6, Ind.

FOX RIVER VALLEY, NO. 72
First Tuesday*
G. M. Waller, *Chm.*, 810 N. Lincoln Ave., Geneva, Ill.

GOLDEN GATE, NO. 28
Third Tuesday*
Al Minetti, *Chm.*, 1021 Noriega St., San Francisco 22, Calif.

GRAND RIVER VALLEY, NO. 81
Third Tuesday*
H. H. Whitehall, *Chm.*, 15 Havill St., Galt, Ont., Can.

GRANITE STATE, NO. 86
Second Tuesday*
J .A. Woodman, *Chm.*, 7 Brochu Ct., Rochester, N.H.

HAMILTON, NO. 42
Second Friday*
G. H. Churchill, *Chm.*, 9 Huron St., Brantford, Ont., Can.

HARTFORD, NO. 7
First Monday*
D. B. Huntting, *Chm.*, 26 Canal St., Windsor Locks, Conn.

HOUSTON, NO. 29
Second Tuesday*
T. J. Gilchrist, *Chm.*, 113 Ashburn, Houston 17, Texas

INDIANAPOLIS, NO. 37
First Thursday*
R. F. Krause, *Chm.*, 6176 Caroline Ave., Indianapolis 20, Ind.

KANSAS CITY, NO. 57
First Wednesday*
W. H. Lebo, *Chm.*, 7319 Rosewood, Mission, Kansas

LEHIGH VALLEY, NO. 83
Third Friday*
E. A. Pelizzoni, *Chm.*, 932 N. St. Elmo St., Allentown, Pa.

LITTLE RHODY, NO. 53
First Thursday*
F. H. Cary, *Chm.*, 9 Codding St., Providence, R.I.

LONG BEACH, NO. 84
Second Wednesday*
J. H. Stansbury, *Chm.*, 174 Park Ave., Long Beach, Calif.

LOS ANGELES, NO. 27
Second Thursday*
Wayne Ewing, *Chm.*, 9700 Bellanca Ave., Los Angeles 45, Calif.

LOUISVILLE, NO. 54
Second Wednesday*
S. F. Reichert, *Chm.*, 1026 Logan St., Louisville 4, Ky.

MADISON, NO. 75
1st Tues. after 1st Mon.
W. R. Carnes, *Chm.*, 2065 Helena St., Madison 4, Wis.

MID-HUDSON, NO. 74
Second Tuesday*
E. W. Thorp, *Chm.*, 380 Mill St., Poughkeepsie, N.Y.

MILWAUKEE, NO. 4
Second Thursday*
H. G. Heimann, *Chm.*, 1607 N. 52nd St., Milwaukee 8, Wis.

MOHAWK VALLEY, NO. 78
Fourth Tuesday*
F. L. Barker, *Chm.*, 35 Spring St., Ilion, N.Y.

MONTREAL, NO. 50
Second Thursday*
Samuel Pedvis, *Chm.*, 456 Dufferin Rd., Hampstead, Que., Can.

MUNCIE, NO. 70
First Tuesday*
A. F. Kurtz, *Chm.*, 2910 S. Jefferson St., Muncie, Ind.

NASHVILLE, NO. 43
Fourth Friday*
F. D. Wright, *Chm.*, 316 Howerton St., Nashville 6, Tenn.

NEW HAVEN, NO. 41
Second Thursday*
M. J. Radecki, *Chm.*, 277 Chapel St., New Haven 5, Conn.

NEW ORLEANS, NO. 60
Second Wednesday*
E. E. Graf, *Chm.*, 3034 Cleveland, New Orleans 19, La.

NEW YORK, GREATER, NO. 34
First Monday*
Carl Kertesz, *Chm.*, 80 Washington St., New York 6, N.Y.

NIAGARA DISTRICT, NO. 65
First Thursday*
C. G. Bradford, *Chm.*, 153 Pleasant Ave., St. Catharines, Ont., Can.

NORTH TEXAS, NO. 51
Second Friday*
I. H. Buck, *Chm.*, 1901 Canton St., Dallas 1, Texas

NORTHERN NEW JERSEY, NO. 14
Second Tuesday*
A. J. Schmidt, *Chm.*, 49 Hinrichs Pl., Bloomfield, N.J.

PEORIA, NO. 31
First Tuesday*
R. W. Bayless, *Chm.*, R.R. 2, Chillicothe, Ill.

PHILADELPHIA, NO. 15
Third Thursday*
L. S. Paulsen, *Chm.*, Manheim Gardens, Apt. 10B, Manheim and Schuyler Sts., Philadelphia 40, Pa.

PIEDMONT, NO. 82
Second Monday*
J. D. Schiller, *Chm.*, 814 Madison Ave., Winston-Salem, N.C.

PITTSBURGH, NO. 8
First Friday*
G. C. Wood, *Chm.*, 814 Clark Bldg., Pittsburgh 22, Pa.

PONTIAC, NO. 69
Third Thursday*
R. E. Lawrence, *Chm.*, 2751 Chadwick Dr., Pontiac 18, Mich.

PORTLAND (MAINE), NO. 46
Fourth Friday*
H. W. Stevens, *Chm.*, S. D. Warren Co., 102 Cumberland St., Cumberland Mills, Me.

PORTLAND (OREGON), NO. 63
Third Thursday*
C. A. Magee, *Chm.*, 2617 S.W. Georgian Pl., Portland 1, Ore.

POTOMAC, NO. 48
1st Thurs. after 1st Mon.*
H. M. McLeod, *Chm.*, 310 Ashby St., Alexandria, Va.

RACINE, NO. 2
First Monday*
G. F. Tigges, *Chm.*, 1751 Orchard St., Racine, Wis.

RICHMOND, NO. 66
Second Tuesday*
M. E. Culbertson, *Chm.*, 821 Northwest C St., Richmond, Ind.

ROCHESTER, NO. 16
First Monday*
E. W. Moore, *Chm.*, 156 Burlington Ave., Rochester 19, N.Y.

ROCKFORD, NO. 12
First Wednesday*
G. H. Rigeman, *Chm.*, 610 15th Ave., Rockford, Ill.

SAGINAW VALLEY, NO. 68
Third Thursday*
Benjamin Phillips, Jr., *Chm.*, 2201 Sheridan Ave., Saginaw, Mich.

ST. LOUIS, NO. 17
First Thursday*
Emil Stempfle, *Chm.*, 5970 Pamplin Ave., St. Louis 21, Mo.

SALT LAKE CITY, NO. 85
1st Fri. after 1st Wed.*
L. C. Seager, *Chm.*, 1194 Crystal Ave., Salt Lake City 6, Utah

SAN DIEGO, NO. 44
Second Tuesday*
E. G. Gray, *Chm.*, 305 San Elijo St., San Diego 6, Calif.

SCHENECTADY, NO. 20
Second Thursday*
Charles Lamb, *Chm.*, 205 Wyman St., Scotia 2, N.Y.

SEATTLE, NO. 39
Fourth Tuesday*
J. C. Smith, *Chm.*, 4532 20th N.E., Seattle 5, Wash.

SOUTH BEND, NO. 30
Second Tuesday*
J. C. Yoder, *Chm.*, 514 E. Ewing Ave., South Bend 14, Ind.

SPRINGFIELD (ILL.), NO. 64
First Tuesday*
C. R. Fenton, *Chm.*, 500 W. Edwards, Springfield, Ill.

SPRINGFIELD (MASS.), NO. 32
Second Monday*
W. T. Ingham, *Chm.*, 110 Ingham St., Willimansett, Mass.

SPRINGFIELD (OHIO), NO. 76
Fourth Thursday*
R. L. Horstman, *Chm.*, 309 Glendale Dr., Springfield, O.

SYRACUSE, NO. 19
Second Tuesday*
H. D. Mozeen, *Chm.*, 314 W. Fayette St., Syracuse 1, N.Y.

TOLEDO, NO. 9
Fourth Wednesday*
R. C. W. Peterson, *Chm.*, Toledo Factories Bldg., Toledo 2, O.

TORONTO, NO. 26
First Wednesday*
J. B. Burk, *Chm.*, 169 Eastern Ave., Toronto 2, Ont., Can.

TRI-CITIES, NO. 23
First Wednesday*
J. L. Howe, Jr., *Chm.*, 2512 32nd St., Rock Island, Ill.

TWIN CITIES, NO. 11
First Wednesday*
L. C. Blanchar, *Chm.*, 818 Wayzata Blvd., Minneapolis 3, Minn.

TWIN STATES, NO. 40
Second Wednesday*
H. H. Ranney, *Chm.*, 31 Clough Ave., Windsor, Vt.

WATERLOO AREA, NO. 79
Third Wednesday*
G. G. Hilge, *Chm.*, 1362 Jewett St., Ann Arbor, Mich.

WESTERN MICHIGAN, NO. 38
Second Monday*
C. L. Fritz, *Chm.*, 1544 Hall, S.E., Grand Rapids 6, Mich.

WICHITA, NO. 52
Second Wednesday*
Emanuel Pitsch, *Chm.*, 2315 Menlo Dr., Wichita 16, Kansas

WILLIAMSPORT, NO. 49
Second Monday*
W. E. Belknap, *Chm.*, 1028 High St., Williamsport, Pa.

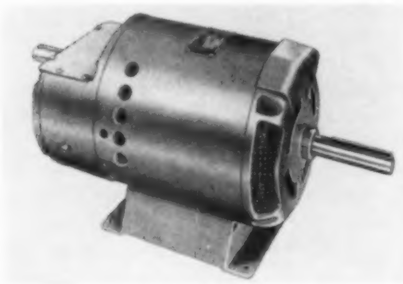
WINDSOR, NO. 55
Second Monday*
W. F. Tyson, *Chm.*, 2205 Hall St., Windsor, Ont., Can.

WORCESTER, NO. 25
First Tuesday*
C. L. Morse, *Chm.*, 21 Roxbury St., Worcester 2, Mass.

*Chapter meeting night.

Tools of Today. . . .

Reversing Magneclutch Transmission by Vickers



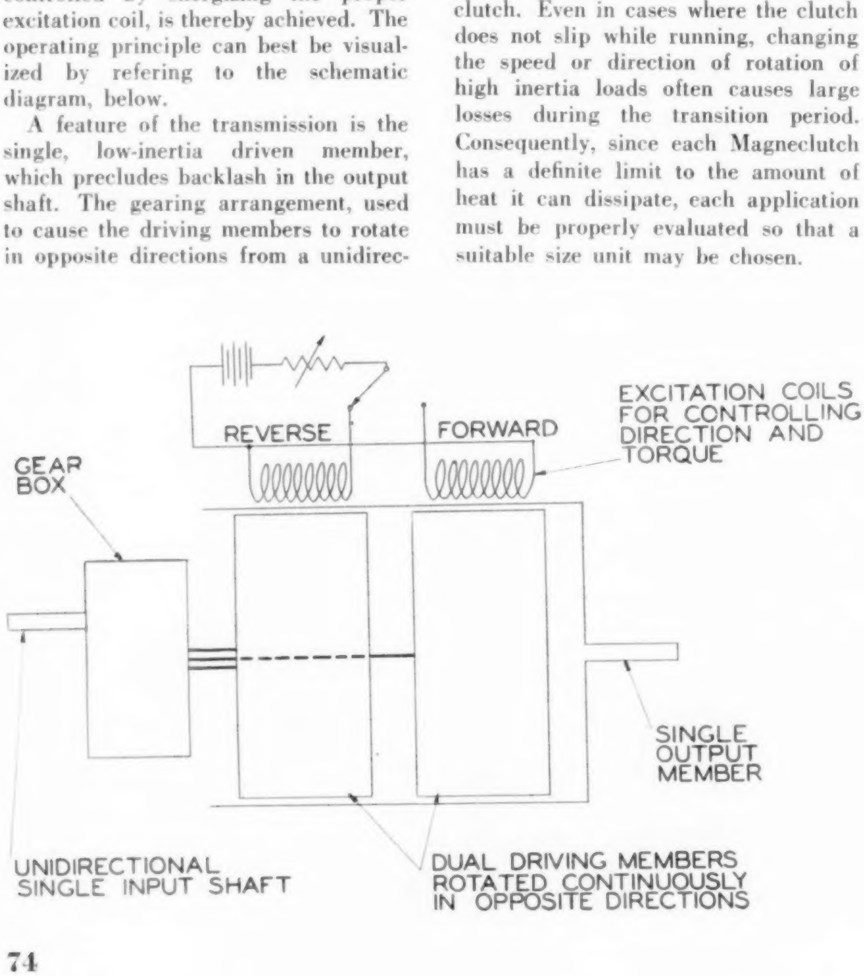
Vickers Electric Division, Vickers Inc., which developed the commercially usable magnetic-particle-type clutch, now announces a reversing 2-speed Magneclutch Transmission featuring a dry magnetic torque medium electrically controlled and readily adapted to remote control.

This 2-speed transmission incorporates two driving members and only one driven member, in which the two former rotate continuously in opposite directions. A simple reversing drive, controlled by energizing the proper excitation coil, is thereby achieved. The operating principle can best be visualized by refering to the schematic diagram, below.

A feature of the transmission is the single, low-inertia driven member, which precludes backlash in the output shaft. The gearing arrangement, used to cause the driving members to rotate in opposite directions from a unidirectional input, need not be limited to any particular ratio. For machine tools, for example, the gearing would be arranged to provide suitable cutting speed in one direction and faster speed for return travel. Besides, the gearbox may be omitted entirely and each of the driving members connected directly to separate sources of power.

A further extension of the dual driving member—single driven member design is a two-speed transmission accomplished by driving the input members at different speeds in the same direction. This arrangement is particularly advantageous for remote control since the excitation power is low and three small wires can carry the current over long distances. The two speeds may be almost the same or—since Magneclutches operate over a wide speed range—they may be widely different.

In applying a reversing or two-speed Magneclutch, the maker stresses that any slip losses are dissipated in the clutch. Even in cases where the clutch does not slip while running, changing the speed or direction of rotation of high inertia loads often causes large losses during the transition period. Consequently, since each Magneclutch has a definite limit to the amount of heat it can dissipate, each application must be properly evaluated so that a suitable size unit may be chosen.



Applications, which include drives for machine tools and other industrial equipment, are so broad that the reader is advised to write Vickers Electric Division, Vickers, Inc., 1815 Locust St., St. Louis 3, Mo., for complete information. **T-1-741**

Portable Hardness Tester

Built like a slide rule and operating on a simple impact principle, the Port-Ah-able hardness tester manufactured by the AH Company, Brighton, Mich., provides easy-to-take hardness readings in all departments from receiving to inspection. Self-contained and measuring only $8\frac{3}{4}$ x $1\frac{1}{2}$ x $\frac{1}{2}$ in., and provided with conversion tables on the reverse side, the instrument may, to all practical purpose, be termed a "go-no go" gage for quality control.

Operation is quick and simple. By releasing a catch—shown at near center—and inverting the tester permits the hammer to drop to "up" position. Then, by placing it vertically—top side up—on the test piece, the Carboloy-tipped hammer drops and rebounds to a point consistent with the hardness of the specimen. The reading on the scale can then be directly converted to the standard Brinnell of Rockwell scales. Or, the scale reading itself will serve as a "plus or minus" for repetitive testing. Fully described in a comprehensive manual. **T-1-742**

USE READER SERVICE CARD ON PAGE 89 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

End Measuring Rods

End Measuring Rods, announced by the Swedish Gage Company of America, 8900 Alpine Ave., Detroit 4, Mich., are designed to serve as a dependable and accurate means of obtaining hole spacings or setting table locations on jig borers as well as for general purpose work. Made from selected steel, and hardened, these rods are seasoned and lapped to Johansson gage block tolerance of "A" quality 0.000004 in. and "B" quality 0.000008 in. per inch.

Each set consists of two each 1, 2, 3, 4, 5 and 6 in. measuring rods, and four 12 in. rods together with two 4 in. micrometer heads, all in a hardwood case. Metric sets, consisting of 2 each 25, 50, 75, 100, 125, 150 and four 300 mm measuring rods together with two 100 mm micrometer heads are also available. Rods and micrometer heads can be purchased individually or in sets. **T-1-751**

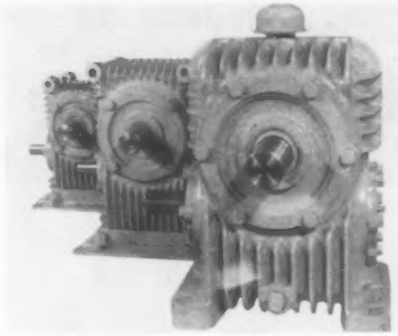
Electro Cutting Oils

Three improved grades of cutting oils, recently introduced by the Gulf Oil Corp., are now being marketed under the name of Gulf Electro Cutting Oils. Said to retain all of the performance features essential to good cutting oil operation, these products are transparent mineral oils containing maximum efficient amounts of highly active sulphur. Lighter colors permit closer inspection of machine parts.

Said to have excellent anti-weld characteristics and extreme load carrying ability, these oils are recommended by the maker for heavy-duty machining operations on ferrous metals and alloys; particularly for low machinability steels. **T-1-752**

USE READER SERVICE CARD ON PAGE 89 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Improved Speed Reducers



Enhanced appearance and greater casting uniformity characterize the improved line of Cone-Drive standard duty speed reducers announced by Cone-Drive Gears, Division of Michigan Tool Company, Detroit 12, Mich. Employing double-enveloping gearing, all operating parts in the improved standard line are directly interchangeable with former models. Shown, left to right, are reducers of 2, $2\frac{1}{2}$ and 3 in. center distance, available respectively in standards ratios of 5:1 to 50:1; 60:1 on the 3 in. Horsepower ratings for these compact reducers range as high as 9.04 hp at 1750 rpm. **T-1-753**

Toolroom Lathe by Rivett

A precision Toolroom Lathe, by Rivett Lathe & Grinder, Inc., Brighton 35, Mass., is designed to provide increased power and ruggedness for precision turning operations. Recommended by the maker for both sensitive instrument work and heavy carbide cutting, this Model 1020S has been constructed to handle any toolroom turning within its 12½ in. swing and 20 in. centers.

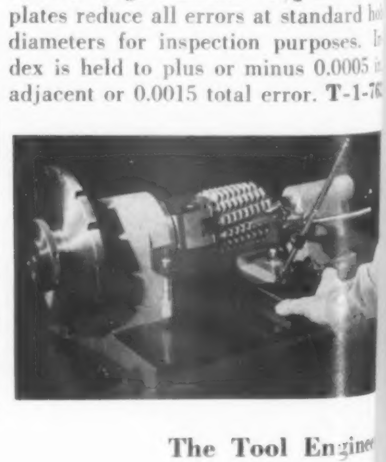
Among features may be mentioned a 3-bearing spindle mounting; a free spindle by direct belt drive operating at infinite speeds up to 3600 rpm; collets mounting directly in the spindle without adapters; hardened and ground feed screws; anti-friction bearings throughout; and a gear box providing 72 feeds and 84 threads including all world standards.

The lathe is also considerably heavier —4000 lbs.—and has headstock back gearing at speeds ranging from 22 to 400 rpm; this, together with a 12¾ wide bed and steel ways uniformly hardened to 60 RC, contributes to its power under severe service. **T-1-761**

Hob Sharpening Checker

A Hob Sharpening Checker, for measuring inaccuracies in hobs or formed cutters due to face sharpening, inspects radialism, flute-to-flute spacing, total spacing, face offset and accuracy of straight flutes with the axis of cutters. It may also be used to check runout of faces and O.D's of hobs.

The instrument utilizes the standard index plates of the Barber-Colman No. 10-12 hob sharpening machine. Because of their large diameter—9½ in.—these plates reduce all errors at standard hob diameters for inspection purposes. Index is held to plus or minus 0.0005 in. adjacent or 0.0015 total error. **T-1-76**



Gaging and Segregating

An automatic Gaging and Segregating Machine for dimensional and load checks of ceramic protector blocks having carbon inserts, such as used in telephone equipment, is announced by The Sheffield Corporation, Dayton 1, Ohio. Designed for rapid changeover and setup on several different blocks, this automatic machine is said to check up to 3,600 parts per hour.

Protector blocks are manually loaded into a magazine-type feed and a blast of air cleans the parts as they move down the chute. The machine stops automatically when fewer than the required number of parts are loaded, thus preventing the machine from indexing while a part is entering the carrier.

A light panel, giving visual indication of results of each gaging operation, enables the operator to view the quality trend of the parts. Sheffield Airlectric and Electrichek heads are used as the gaging mediums. Rejects are segregated into maximum and minimum chutes, and parts passing all gaging stations are indexed to and unloaded at a chute which carries them on an endless belt conveyor outside the machine. **T-1-771**

Vitrified Bond Wheels

5 to 10 percent boost in grinding and finishing output is promised users of grinding wheels and mounted wheels by Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago 7, Ill., as a result of their recently developed "79E" vitrified bond.

The "79E", which is said to assure a smoother, faster cutting action for vitrified wheels operated at speeds up to 600 sfm. is recommended by the maker for portable grinding of billets, brake drums, forgings, forging dies, malleable and steel castings, and stainless steel welds.

T-1-772

TO REQUEST ADDITIONAL INFORMATION USE READER SERVICE CARD ON PAGE 89

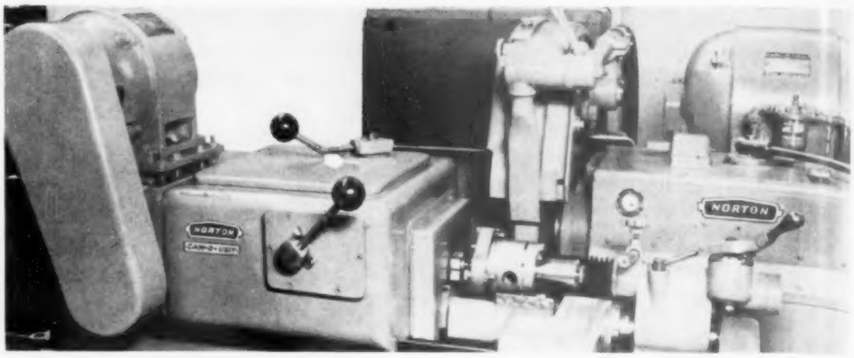
Tongs to Prevent Die Damage

Recently introduced safety tongs of novel design and construction are designed to crush, if caught within the die opening, without inflicting damage to the die or punch.

Called the Magliner Tong and cast from a special magnesium alloy and weighing only 6 ounces on the medium duty line, the tongs permit easy one-hand operation with resultant reduction in operator fatigue and increased output in addition to safety. Standard and special models are available, and complete information may be had from Magline, Inc., Pinconning, Mich.

T-1-773

Grinding Developments by Norton Company



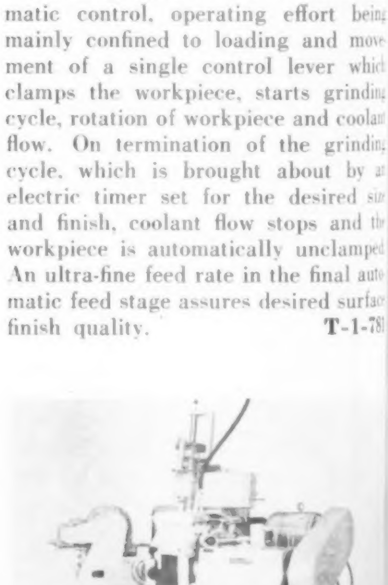
Announced by Norton Company, Worcester, Mass., is a unit for grinding automotive or other types of pistons where a taper to the conventional relief form is required. The Norton unit grinds the desired shape by holding the piston between centers. The head of the piston is carried on a dog, and centered on the master cam spindle center.

The bottom end of the piston is supported on a special footstock center carrying a spherical ball bearing. The footstock itself does not rock by reason of being mounted on the rocking bar, as in normal cam grinding practice; rather, it is mounted on a stationary member of the machine and the spherical ball bearing becomes a pivot about which the piston revolves and oscillates according to the motion of the rocking bar as imparted by the master cam. Since it is a stationary point, in-and-out motion of the footstock pivot is zero.

Therefore, the motion and corresponding amount of piston relief that is ground at any point between these centers are proportional to the distance from the footstock pivot. Thus, a greater amount of relief is ground at the head of the piston than at the bottom of the skirt, which is nearer the pivot.

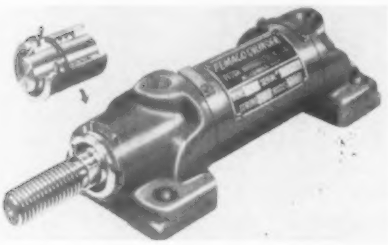
Also, by Norton Company, is a semi-automatic Valve Grinder which combines high speed production with high precision and fine finish. This machine grinds the faces of automotive and aircraft type valves having face angles of 0 deg through $62\frac{1}{2}$ deg, with face diameter 7/16 through $3\frac{1}{2}$ in., and with stem diameters up to and including $\frac{3}{4}$ in.

Grinding cycle is under semi-automatic control, operating effort being mainly confined to loading and movement of a single control lever which clamps the workpiece, starts grinding cycle, rotation of workpiece and coolant flow. On termination of the grinding cycle, which is brought about by an electric timer set for the desired size and finish, coolant flow stops and the workpiece is automatically unclamped. An ultra-fine feed rate in the final automatic feed stage assures desired surface finish quality. T-1-78



Cartridge Packing Gland

A self contained cartridge-type packing gland for hydraulic and air cylinders is announced by the Petch Manufacturing Company, P.O. Box 202, Mt. Clemens, Mich. Marketed under the name Pemaco "E-Z-Pak" Gland and designed to comply with J.I.C. standards, the gland combines bearing surface, a low friction ram seal, and a seal guard ram scraper into a single, compact unit.



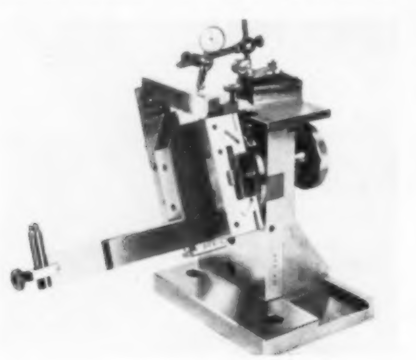
Bearing surface is provided by a bronze bushing on each side of the packing rings—an arrangement designed to provide maximum packing life. Positive packing protection is further afforded by a bronze scraper—or seal guard—which excludes external abrasives. As the metallic packing is self-adjusting, no adjustment is necessary after installation. A feature of the gland is that replacement can be effected without dismantling the cylinder. T-1-791

Sludge Separator

The Magna Veyor, by Pirie Engineering Co., Melrose, Mass., is designed to continuously separate sludge from coolant and to automatically discharge it into a full-size waste barrel. As claimed, about 400 lbs. of waste material can be collected before it is necessary to empty the barrel. Larger containers can be used provided height does not exceed 30 in.

The unit is especially useful for handling the chips developed in heavy grinding operations on ferrous metals. Here, the Model GA-25 is said to continuously remove about 100 lbs. of sludge per hour. T-1-792

Universal Wheel Dresser



A Universal Wheel Dresser said to be capable of dressing a complete form, rather than a single radius and angle tangent, is announced by the Universal Form Tool Co., 7410 Rutherford Rd., Detroit 28, Mich.

The dresser operates through movements in the column and base with gage block application. Angles may be set with a sine bar in addition to graduations, and claimed absolute accuracy is accomplished by pre-loaded ball bearing angle slides and rotating bearings. It may be used under the wheel or at the side, and all settings may be made without removing the unit from the machine.

With the gooseneck removed, the tool may be used as a revolving fixture for the rolling of radii, and all setting positions contain a 0.200 in. step for settings starting from 0.0001 in. and up. The knob that revolves the radius actuates the slide when locked in angle position. T-1-801

Flash Welder Control

Developed for use with any flash welder having transformer capacity up to 500 KVA, the Hydra-Flash is a fully automatic unit with adjustments calibrated for rapid duplication of set-ups. This control is said to enable the flash welder, to which it is applied, to weld any material that is practical to flash weld in any cross section area within its physical and electrical capacities.

The range of cross sectional areas that any flash welder can ordinarily accomodate is said to be extended as much as 40 to 1. The unit is designed for conversion of mechanically driven flash welders to hydraulic operation, and simplicity of control is indicated by the fact that only one limit switch is required to operate any standard flash welder. Complete information available from Kingsley A. Doutt, 18465 Schaefer Highway, Detroit 35, Mich.
T-1-802

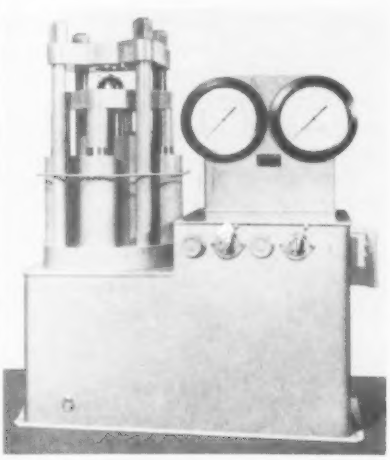
Set Screw "Demonstrator"

To show the unique and positive self-locking action of their "Zip-Grip" set screws, Set Screw & Mfg. Co., 2600 Main St., Bartlett, Ill., now furnish "demonstrators" which effectively show comparison between standard and Zip-Grip set screws. The "demonstrators" are available from the manufacturer on request. T-1-803

TO REQUEST ADDITIONAL INFORMATION USE READER SERVICE CARD ON PAGE 89

Ductility Testing Machine

A Ductility Testing Machine said to provide a total capacity of 250,000 lbs. pressure and incorporating a unique 5 in. diameter penetrator has been made by Steel City Testing Machines, Inc. Purpose of the unit is to detect surface and sub-surface imperfections in deep-drawing steel over a comparatively large area.



The machine is motorized, hydraulically operated, and provides separate controls for clamping the sample and for regulating the penetrating pressure. Penetrating pressures can be applied up to 150,000 lbs. while clamping pressures are provided up to 100,000 lbs. Equipped with a set of three dies for use with different gages of metal, the machine will test material up to ¼ in. in thickness.

Additional information about this testing machine may be secured by writing Steel City Testing Machines, Inc., 8843 Livernois, Detroit 4, Mich.

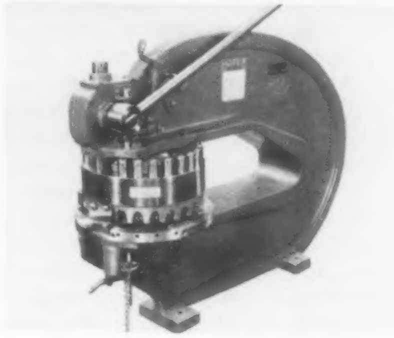
T-1-811

Expansion Reamer by W/S

A carbide-tipped Expansion Reamer, by Wendt-Sonis Company, Hannibal, Mo., is designed for easy and accurate expansion. Claimed for the tool is a true hole with fine finish. The reamer is available in sizes ⅜ to 1½ in., both straight and taper shank.

Features include longer carbide tips, for extra bearing surface in the hole, and diamond-lapped cutting edges to assure free cutting action. The tool shanks, of high-quality heat treated materials, are rust resistant. **T-1-812**

"Rotex" Punch Press



Designed with a 24 in. throat to handle sheets up to 48 in. wide, the Model 18-B Rotex punch press incorporates as a special feature a rotary turret that enables an operator to quickly locate any of 18 desired punch sizes. The turret rotates to location and locks into position automatically.

The 18 punch stations can be furnished in 5/64 to 2 in. sizes for use with cardboard, fiberboard, plastic or sheet iron up to 10 ga. thickness. Engineering specifications on three principal models may be had from Rotex Punch Co., 4726 E. 12th. St., Oakland, Calif.

T-1-813

Internal Grinding Attachment

A constant-speed precision grinder has been developed by South Bend Lathe Works, South Bend, Ind., to meet the need for an internal grinding attachment having sufficient power to maintain a more constant wheel speed under varying loads, and to prevent stalling under comparatively heavy cuts.

The South Bend Internal Grinder is powered by a standard type, constant-speed, continuous-duty 1/6 hp, 3450 rpm, AC motor which, according to the maker, has proved to be superior to the universal type AC—DC motors ordinarily used. The motor is compound belted, through an intermediate shaft, to obtain a quill spindle speed of 30,000 rpm, and tests have shown that less than 1000 rpm drop in spindle speed occurs when taking cuts as heavy as 0.003 in. on a side in hardened steel. Power loss is therefore negligible.

The grinding wheel and intermediate shaft spindles run on high-precision high-speed ball bearings which require no adjustment. Lubrication, supplied from built-in oil wells, is effectively sealed in the spindle units, and dust sealed out in such a way that the bearings will retain their precision indefinitely. The compound belting and the two pulleys are enclosed by a one-piece guard.

Four arbors are supplied, the longest permitting a hole $3\frac{7}{8}$ in. deep to be ground when using a 1 in. wheel. Four grinding wheels for these arbors with $\frac{1}{4}$ in. face; $\frac{1}{4}$ in. bore; and $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ and 1 in. diameters, are included.

T-1-821

Geneva Dial Indicator

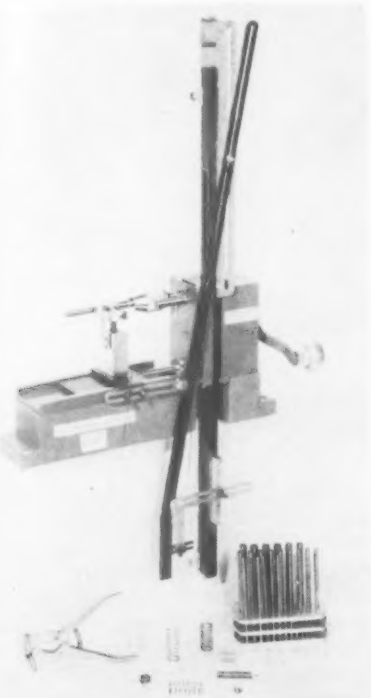
Incorporating a simple yet exact lever movement instead of compounded gears resulting in fewer moving parts, the Geneva Dial Indicator is designed for precision checking of variations in contour, dimension or roundness.

Along with other Geneva dial indicators graduated 0.0005 and 0.001 in., it features an adjustable dial with positive internal lock for fine settings; a metal dial with clear graduations; convenient size—2 in. dia. x $\frac{1}{2}$ in. thick; case and plunger housing machined as one piece from a solid brass casting; hard chromium plating; hardened, ground, and draw-finished plunger; and special bearings for long wear and low friction.

Sets, furnished in a compact metal box, include a wide range of accessories. Complete information from Chicago Dial Indicator Co., Dept. L, 180 No. Wacker Dr., Chicago 6, Ill.

T-1-822

Hand-Operated Coiler



A hand-operated Spring Coiling Machine, by The Carlson Co., 277 Broadway, New York 7, N. Y., is designed for making experimental or sample springs and for small production runs.

Compression springs are coiled with ends squared or closed with any number of coils up to 28. Extension springs may be coiled tight or loose up to 100 coils. Diameters up to 7/8 in. and over-all lengths up to 4 in. are obtainable, using wire diameters from 0.005 to 0.065 in. **T-1-831**

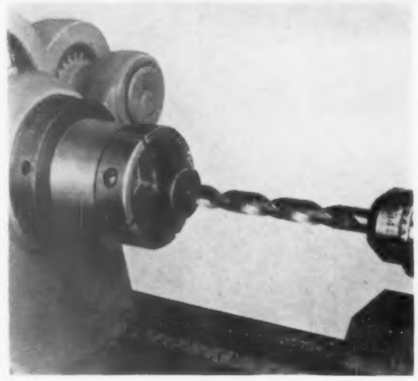
Improved Magna Eye

The Magna Eye, for height gages and vernier calipers, has been redesigned and provided with improved lenses to cover a wider field with greater accuracy in reading. Focusing points are shorter, the instrument is more compact and posts have been redesigned to tightly screw into the base, thus insuring greater rigidity. The Stebar Co., 711 West Lake St., Minneapolis 8, Minn. **T-1-832**

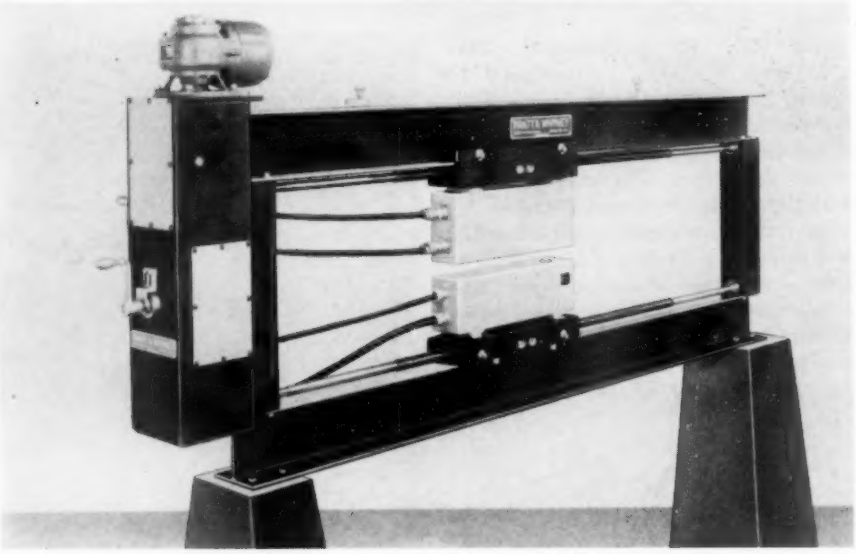
Self-Centering Chuck

A self-centering Spring Chuck, announced by the Self Centering Spring Chuck Co., 40 Summerfield Ave., Bridgeport 8, Conn., is designed to reduce direct labor costs by eliminating normally expensive jigs incidental to machining operations on screw machines and lathes. The chucks further permit holding of irregular shapes.

As stated, work pieces may be seated and removed with light finger-pressure. Once seated, the work is centered and gripped by four spring actuated jaws. Easy-to-make metal pads, screwed to the chuck jaws, may be adapted to round or irregular-shaped parts. Currently available in range capacities from 1/2 to 8 in. **T-1-833**



Traverse Mounting for Beta Ray Gage



A traverse mounting, now available for the Pratt & Whitney Beta Ray Continuous Mill Gage, makes it possible to scan and gage the full width of continuous strip material. This recent mounting is expected to prove of particular value in controlling the edge-to-edge uniformity of sheet rubber, plastic, paper, asbestos, cloth, metal and other compositions. The rate of scanning is said to be from 18 to 30 in. per minute, with the operation completely automatic.

Limit stops are set on the rail of the traverse mounting so that, when the Beta Ray gaging heads reach the edge of the strip material, they automatically reverse and scan in the opposite direction. This permits a complete cross-sectional and longitudinal analysis of the material being processed.

Recorders are available for use with the gage, and process control or alarm signal circuits may be incorporated in the installation if desired. The Beta Ray Gage uses radioactive isotopes from the atomic pile for measuring thickness deviations in continuous strip material. As it is non-contacting, it readily gages substances which are wet, sticky, highly polished or soft. Complete information may be had from Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn.

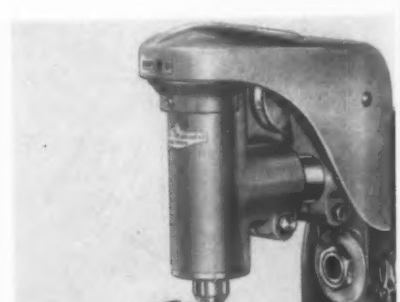
T-1-841

SS T-Slot Cutters

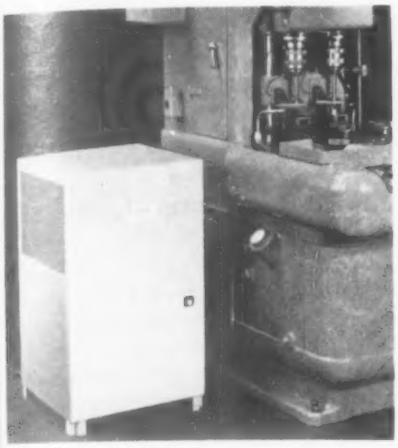
T-Slot Cutters with straight shanks have been recently added to the Reltool line, which are designed for use in Reltool and other standard holders, these cutters feature greater side chip clearance to provide free cutting action and less breakage. Staggered teeth are undercut and conform to the recently adapted Simplified Practice Committee standards. The cutters, a product of Reltool Corporation, 4540 W. Burnham St., Milwaukee 46, Wis., are available from stock in a full range of sizes, both straight and taper shank. **T-1-842**

Milling Attachment

Marvin Machine Products Inc., 414 Ford Bldg., Detroit 26, Mich., has introduced an improved, streamlined Vertical Milling Attachment offering precision, ruggedness and safety for the operator, the latter provided by a protecting hood over the power transmission parts. The attachment mounts on the overarm of a horizontal miller, drive being transmitted by a pulley on the spindle through idlers to the vertical spindle. **T-1-843**



Industrial Fluid Coolers



Frostrode Industrial Fluid Coolers, manufactured by Frostrode Division of Viking Products, Mich., are designed to accurately control the temperature of coolants—grinding and cutting oils; water; hydraulic oils and plating solution—used in industrial processes. The illustration shows a unit used to supply cooled coolant to a Micromatic honing machine.

The coolers used an air-cooled refrigeration cycle to cool the fluid. The flow circuit is designed to provide a maximum heat transfer with a minimum pressure drop or flow restriction.

T-1-851

NEMA Face Mountings

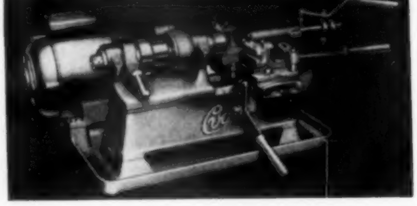
Electro Machines, Inc., Cedarburg, Wisconsin, announce the completion of their line of NEMA type C face mountings for the standardized 42, 56, and 66 fractional horsepower frame series. The details of these mountings are shown in the illustrations.

The front view of each frame shows the streamlined, built-in conduit box which, carried through the design of all three frame sizes, was designed specifically to give adequate room for making the connections for 9-lead, dual-voltage motors normally used as standard equipment on coolant pumps and other machine tool applications. The conduit opening can be furnished with a 7/8 in. plain hole or a 1/2 in. pipe tap.

T-1-852

2nd Operation Bench Lathe

Announced by DCMT Sales Corp., 164 Duane St., New York 13, N.Y., is the C.V.A. Bench Lathe designed for second-operation work. The machine is equipped with lever-operated collet attachment, tailstock and compound slide, the latter mounting front and rear tool holders. These are adjustable for height while angular adjustment up to 22 deg left and 33 deg right can be set up on the front tool slide. Adjustable dead stops are provided for both the compound slide and tailstock.



Drive from a 2-speed motor to the main spindle, which runs in adjustable bronze bearings, is via flat belt provided with an adjustable idler for tension. Standard equipment includes the motor and one each ½ in. dia. headstock collet and ¼ in. dia. tailstock collet.

Also announced by DCMT is a precision Toolroom Lathe and a vertical Milling and Diesinking Machine, both having features warranting serious consideration. All fully described in company literature.
pany literature. T-1-861

Self-Centering Chucks

Hauser Machine Tool Corp., 30 Park Ave., Manhasset, N.Y., is now prepared to make shipments from U.S. stocks on all sizes of the keyless self-centering Drill Chucks manufactured by Leo Hjort Co., Copenhagen, Denmark.

A precision product, the jaws of these Hjort chucks are hardened to Rockwell 64 C and have a claimed tolerance of 1/12,000 in. All parts are interchangeable, and the chuck is said to withstand any strain imposed on the drill with sustained accuracy. Ball bearing construction permits easy opening by hand even after the heaviest drilling work.
T-1-862

Precision Tapes by Starrett

A line of precision case type Steel Tapes, by the L. S. Starrett Co., Athol, Mass., offers the user many convenient features in addition to a high standard of accuracy. No. 550 Series, shown, has a ⅜ in. wide tape line of high quality tape steel with quick-reading graduations accurately etched in feet, inches and eighths on a no-glare black background. Available in 25, 50, 75 and 100 ft. lengths in either or both English and Metric graduations.

A novel feature is the folding hook on the end of the ring. When hooked over a projection, or pressed into wood or earth, it enables the user to take measurements without assistance. A rugged steel case is covered with durable, weather-resistant artificial leather held in place by a heavy, nickel-plated concave-convex ring. Complete information on these and other Starrett case type steel tapes is available in catalog form through the manufacturer.

Air Gage for Rough Bores

A contact plug for P & W Air-O-Limit Internal Comparators is designed for air gaging of rough surfaced bores with a high degree of accuracy. The rate of air flowing through the gaging plug is controlled by carbide buttons, mounted on spring leaves, which are depressed by contact with the work during gaging. By impeding the escape of air from small nozzles within the plug, the resultant change in line pressure causes the Air-O-Limit indicator to show the exact variation from basic diameter in decimal terms.

The contact plug is especially suited

for diamond boring and reaming operations where finishes exceed 50 microinches—a degree of roughness that, ordinarily, precludes use of conventional air gaging plugs. The plugs can be furnished with either an easy-entry bullet nose or a pilot nose which permits fast and accurate operation. Complete information available from Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn. **T-1-871**

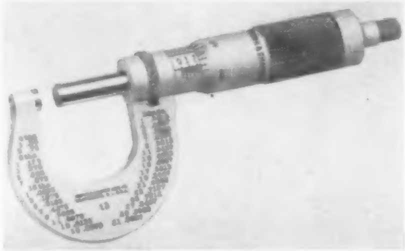
Periphery Press Holder

M. E. Cunningham Co., 169 E. Carson St., Pittsburgh 19, Pa., announces a Periphery Press Holder designed for marking the outer circumference of small-diameter parts. This Model PPH-10 holder is custom made for each job, with the radius, size and number of characters determined by the piece to be stamped.

Made with shank size to fit any press, this press holder uses regular straight sided type, thereby eliminating the extra expense of the curved type normally used for marking curved parts. **T-1-872**

Micrometers by B & S

Brown & Sharpe Mfg. Co., Providence 1, R.I., now offers a completely im-



proved line of Outside Micrometers designed to make precision measuring easier, accuracy surer, and the micrometers longer lived.

Among major improvements are: carbide measuring faces; large diameter thimble with wide space divisions for easier reading; one-piece stainless steel spindle and screw; and rust proof hardened and ground threads.

Additional features include dull chrome finish, black graduations, and quick thimble adjustment. **T-1-873**

Technical Shorts . . .

Manufacturers of stainless steel pip and fittings met recently with repre sentatives of the chemical industry a the American Standards Associatio and voted to request inclusion o Schedule 5S for light-weight stainles steel pipe fittings in an America Standard.

The meeting, which was held unde the auspices of a subcommittee of th Chemical Industry Correlating Com mittee of ASA, was called to revie the experiences of the various compa nies using the schedule in questio Mutual agreement between manufa turers and users represented was th Schedule 5S stainless steel pipe i practical and considerable tonnage o the material would be used for futur construction in the chemical industr

The schedule as recommended range from nominal pipe size ½ in. at nom nal thickness of 0.065 in. to nomin pipe size 12 in. at nominal thickne of 0.165 in.

In an attempt to correlate late de velopments of radiography, the pape and discussions of a session on radio raphy at the 52nd annual meeting o the American Society for Testing Ma terials have been published in bookl form.

Copies of this widely illustrated pu lication STP 96 may be obtained fro the American Society for Testing Ma terials, 1916 Race St., Philadelphia for $1.75 each.

A material which remains liquid long as a stream of air bubbles throu it, but hardens in a few minutes aw from air, has been developed by r search men in the chemistry divis of the General Electric laboratory.

Outstanding characteristic of t substance is that it is able to penetra extremely small cracks before hard ing; thus one of its practical appli tions may be to provide a tight se for stopping nearly invisible leaks, as a "pipe dope" for sealing thread unions. In certain applications its d velopers foresee particular advanta as in between pieces of metal pla closely together, where varnish is som times used. In this case, the liqu solvent in which the solid resin ordinary varnishes is dissolved, eva rates at the surface nearest air, leavi a skin of varnish which seals in t remaining liquid. The newer mater however, reverses the process and mains liquid as long as it is aera hardening fully without the necess of evaporation.

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-1-22	ALLEGHENY LUDLUM STEEL CORP.		Four-page "Blue-Sheet" presents technical data on B-47 hot work steel and its uses.
A-1-104	AMERICAN BROACH & MACHINE CO.	Circular 300	Shows company's line of hydraulic surface broaching machines.
A-1-78	ARMSTRONG-BLUM MFG. CO.	Catalog 49	Discusses metal-cutting saws and saw blades.
A-1-99	THE BELLOWS CO.	Bulletins CL-15, DF-105, T-25	Tips on ways to more all-round economical production.
A-1-4	THE CINCINNATI SHAPER CO.	Catalog B-2A	Describes operations, features and special arrangements on company's press brakes.
A-1-129	THE CUSHMAN CHUCK CO.	Catalog 64, PO-64	Deal with wrench and power operated chucks.
A-1-95	EASTMAN KODAK CO.		Booklet covers Kodak contour projector.
A-1-130	GROBET FILE CO. OF AMERICA, INC.	Catalog Sheet HC1	Describes chatterless countersinks.
A-1-86	HAMMOND MACHINERY BUILDERS	Catalog 225	Presents features and advantages of carbide grinders.
A-1-115	HANNIFIN CORP.	Bulletins 110, 210	Cover company's hydraulic and air cylinders.
A-1-18	HAYNES STELLITE DIV.		"Investment Casting" gives tips in designing parts to be produced by company's process.
A-1-8	METAL CARBIDES CORP.	Catalog 48WP	Prices, sizes and specifications included in booklet on centerless blades.
A-1-119	MILLER MOTOR CO.	Bulletin B-200	Explains details of line of fluid pressure boosters.
A-1-125	ILLINOIS TOOL WORKS		Handy-sized size and price list of cutting tools carried in stock.
A-1-83	THE KEMPSMITH MACHINE CO.		Arbor bulletin describes company's complete line of arbors and accessories.
A-1-108	SCULLY-JONES AND CO.		Catalog, bulletins, complete with price lists, on 57 of company's standard production tools.
A-1-13	SUNDSTRAND MACHINE TOOL CO.	Bulletins 703, 703M	Information on company's "engineered production" including specific tooling and production data; material and data on Sundstrand magnetic fixtures.
A-1-114	SUPER TOOL CO.	Catalog 50	Covers line of carbide cutters for machining aluminum, cast iron, steel, etc.
A-1-94	THE HENRY G. THOMPSON & SON CO.		Literature contains money-saving ideas as concerns profile saw blades and their uses.
A-1-124-1	THE VAN KEUREN CO.	Catalog & Handbook 34	208-page volume covering 2 years research on thread measuring wires.

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FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Self-Centering Drill Chuck

Folder shows keyless self-centering drill chuck in operation; outlines main characteristics; cross-sectional drawing shows assembled parts. *Hauser Machine Tool Corp.*, (representing Leo Hjort Co., of Copenhagen) 30 Park Ave., Manhasset, N. Y. L-1-1

Air Feed

Circular points out special features of automatic air feed; illustrates efficiency and economy through three outlined case histories; specifications and typical examples of automatic feeding operations also shown. *Great Western Tools, Inc.*, 3811 Riverside Dr., Burbank, Calif. L-1-2

OBI and Gap Presses

Recently announced line of Open back inclinable and gap presses made up of two basic designs shown in bulletin 1000 containing detailed description of construction and description and diagram of the Columbia Alcone clutch used in the line. *Columbia Machinery & Engineering Corp.*, Hamilton, Ohio. L-1-3

Microscopes

Illustrated pamphlet outlines main advantages and features of toolmaker's microscope; complete specifications included. *The Boeckeler Instrument Co.*, 31 E. Rillito St., Tucson, Arizona. L-1-4

Lubrication

"Hi-Temp Oils" explains results of extensive research program on high temperature lubrication, describing testing procedure used in setting up three series of Hi-Temp oils to meet high temperature conditions. *E. F. Houghton & Co.*, 303 W. Lehigh Ave., Philadelphia. L-1-5

Heat Treating Furnaces

Surface rotary retort controlled atmosphere furnaces for gas carburizing, dry cyaniding, homogeneous carburizing and clean hardening presented in illustrated brochure; important features outlined and cross-sectional drawing shows operation. *Surface Combustion Corp.*, Toledo 1, Ohio. L-1-6

Collets

Order bulletin No. 50 gives up-to-date listing of popular style collets for all makes of lathes and millers; presents latest design collets for new machines showing major dimensions; maximum capacity for round, square, hexagon; collet adaptation for nose type chucks; prices and ordering information. *Hardinge Brothers, Inc.*, Elmira, N. Y. L-1-7

Polishing Grain

Bulletin ESA-198 deals with Borolon aluminum oxide abrasive grain for polishing operations; contains abrasive grain size recommendations for typical polishing operations and includes detail on polishing wheel set-up data. *Simonds Abrasive Company*, Tacony and Fraley Sts., Philadelphia 37. L-1-8

Gear Shaving

Catalog page offers discussion of effect on tool life of gear blank rehardening due to improper rough turning by outlining specific trouble encountered and remedy found and used; illustrated. *National Broach and Machine Co.*, 5600 St. Jean, Detroit 13. L-1-9

Carbide Tools

Brochure announces line of precision machine ground, solid tungsten carbide rotary files, reamers, end mills, internal grinding tools, boring bits and knurls. Fully described and illustrated. *The Charles L. Jarvis Co.*, Middletown, Conn. L-1-10

Lathes

Forty-four page catalog 1113 reviews major design engineering features and performance improvements of company's "Series 60" engine and toolmaker's lathes in 12, 14, 16 and 20 in. sizes, fully illustrated with accompanying concise descriptions; also covers accessories and attachments for machines and presents pictorial summary of quality control techniques used in the lathe manufacture. Available on letterhead request only. *Monarch Machine Tool Co.*, Sidney, Ohio. L-1-11

Drill Presses

Illustrated folder on "series 1600" light duty drill presses, which includes 12 models in one, two, three and four spindle units, bench and floor type, also pictures and describes assembly parts for special set-ups, tapping machines and line of accessories. *Boice-Crane Co.*, 934 Central Ave., Toledo 6, Ohio. L-1-12

Gears (Lubrication)

Illustrated manual "Gears and Their Lubrication" covers types, shaft speeds and other fundamentals of gears, need for lubrication with discussion of results of neglect; sections treat enclosed and open gears with charts for determining lubrication load, and various recommendations; points out differences in lubricants in company's line. *Socony-Vacuum Co., Inc.*, 26 Broadway, New York 4. L-1-13

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A technique is in the developmental stage in the laboratories of Westinghouse Electric Corporation for the induction heat-treating of nonferrous metal strip such as aluminum, brass, copper, magnesium and stainless steel. Known as "transverse flux induction heating," the method is hailed by the company's researchers as an answer to the problem of practical and economical continuous induction heat treatment of nonferrous strip.

Radio frequency induction heating used for magnetic steel strip is not suitable for heating nonmagnetic strip because of low power factor and inefficiency and because the small cross section of the nonmagnetic strip intercepts only a very small percentage of the flux through the inducing coil, according to a Westinghouse report. Since the magnetic flux is directed perpendicular to the surface and through the strip instead of along its length, as in conventional radio-frequency induction heating, this difficulty is overcome.

The newer technique involves passing strip between two opposing laminated pole structures. The field coils, supplied with alternating current, are oppositely polarized so that flux is forced through the strip. Frequencies of from 60 to 10,000 cycles per second are used, depending on the thickness of the strip and its resistivity.

Several industrial research fellowships in mechanics, metallurgy, electrical engineering, ceramics, physics and chemistry, to begin in September, 1951, are being offered by the Armour Research Foundation of Illinois Institute of Technology. Winners of the awards will attend the institute half-time and work in the Research Foundation half-time in a program leading to advanced academic degrees.

Application forms and information may be obtained from the Office of Admissions, Graduate School of Illinois Institute of Technology.

Eutectic Welding Alloys Corporation is sponsoring a prize competition for technical papers having to do with research and development in the field of 'non-fusion' welding processes.

According to the company announcement, subject of papers to present is defined as "Technological and Research Aspects, Advances and Advantages of the Use of Lower Melting (lower than parent) Filler Metals in the Non-fusion Welding Processes."

Papers may specifically cover oxy-acetylene low melting filler, oxy-fuel gas, low melting filler, brazing and bronze welding and hard facing, and resurfacing with low melting filler.

Rules governing the competition may be secured by writing to the company at 40 Worth St., New York 13.

Good Reading

A GUIDE TO SIGNIFICANT BOOKS AND PAMPHLETS OF INTEREST TO TOOL ENGINEERS

ILLUSTRATING FOR TOMORROW'S PRODUCTION, a collaboration by J. Harold Farmer, Abbott J. Hoecker, and Francis F. Vavrin. Published by the Macmillan Company, New York; 203 pp; price $5.00.

This book, which is based on the extensive teaching experience of the authors, each of whom is an artist of note, shows in easy, one-at-a-time steps how to make a perspective drawing from an orthographic drawing; how to make true-scale exploded drawings; and how to make freehand drawings using mechanical construction principles.

Isometric and oblique drawing is clearly explained, each step being illustrated, and many illustrations in color lend to clearer understanding and easier grasp of the subject matter. A truly excellent work which should be of especial interest to beginners and professional artists.

PRINCIPLES OF STRETCH-WRAP FORMING, issued by Hufford Machine Works, Inc., 207 N. Broadway, Redondo Beach, Calif. 87 pp; price $5.00.

While the contents largely center on proper selection, tooling and operations of Hufford stretch-wrap forming machines, the book as a whole provides an unusually comprehensive insight into the theory of stretch-wrap forming, design of dies with recommendations for materials, and techniques incidental to the process. The book is profusely and clearly illustrated and replete with actual tooling setups.

METALS AT HIGH TEMPERATURE, by Frances H. Clark, Consulting Metallurgist. Published by Reinhold Publishing Company, New York. 372 pp; price $7.00.

This book, which is among the pioneers in its field, is designed primarily to cover heat-resistant alloys and special alloy steels; however, it also includes other metals such as aluminum, lead and magnesium alloys. Also included is a considerable amount of tabular data giving properties of all the latest alloys which have been developed for service at extremely high temperatures.

Following a theoretical discussion, as introduction to the text, the book is further devoted to a full discussion of the phenonenom of creep in metals and alloys, and there is evident effort to include all of the most relevant data pertaining to this important property. There is also a section on test methods

CASTING AND FORMING PROCESSES IN MANUFACTURING, by James S. Campbell, Jr. Published by McGraw-Hill Book Co., New York. First edition; 536 pp; price $5.00.

The author, an assistant professor of mechanical engineering at Renselaer Polytechnic Institute, has produced a book which, in the one volume, covers casting processes, plastic molding and forming, powder metallurgy, rolling, forging, sheet metal working and punch press operations with rather unusual thoroughness.

Modern shop and welding processes are not included; however, special emphasis has been placed on design and modern mass production techniques, the whole primarily written for students in mechanical engineering yet also slanted to needs of engineers engaged in the processes under discussion.

Following an interesting introduction, the book embraces patternmaking; molding techniques; foundry practises and equipment; sand casting design; precision investment casting; and permanent mold and die casting in some 350 pages. The section on forging covers about all of the processes currently in use, including rotary swaging, and the balance is devoted to sheet metal working and punch press operations. Really an excellent text book for students as well as a reference for professional engineers.

POWER PRESS HANDBOOK, by the E. W. Bliss Company, Toledo 7, Ohio. 717 pp; price $7.50.

This edition should be of more than ordinary interest to engineers, production and maintenance executives—and, it may be added, to students—connected with operation of presses and dies in the manufacture of pressed metal products. It may be considered an authoritative guide in its field.

Section I describes and illustrates the four major classifications of sheet metal working—blanking, forming, drawing, and squeezing. This section also includes simple die layouts, formulae and examples, recommended procedures to select the proper press for a given job, pressure capacity charts and many useful tables.

The balance of the book contains illustrations and descriptions of the wide range of Bliss presses and the class of work for which they are best suited. Tonnage ratings and other information of especial value to tool and die engineers are included, along with a glossary of recent terms and expressions, the latter particularly beneficial to press users in localities using different nomenclatures.

 Continued from Page 73

Claims Varied Advantages For Steam Treatment

Philadelphia, Pa.—Modern furnace design and automatically controlled atmosphere provide higher heat treat production rates, uniform quality, lower material handling and cleaning costs, and economy in operations prior to heat treat.

F. L. Spangler of Leeds & Northrup Co. named these advantages in "New Developments in Heat Treating," while speaking November 16 before 110 members and guests of Philadelphia chapter.

Mr. Spangler explained temperature control systems, atmosphere systems, and atmosphere control devices. One system with automatic carbon control to a predetermined potential was claimed as a major advancement in the industry.

T. C. Bradford of Worcester, national membership committeeman, speaks at Philadelphia chapter. At right is T. J. Donovan, Jr., national director.

Engineers, Mr. Spangler stated, should consider savings in smaller raw material stock sizes, together with a restoration treatment to remedy the decarburized surface of steel sheets and bars.

Steam atmosphere treating in ranges of 600-1200 deg F offers interesting advantages. It provides a clean surface. On ferrous metals, scale-free tempering or stress relieving is accomplished. It gives a controlled oxide coating of uniform blue gray finish. He reported increases of from 25-400 percent in the life of hss drills. Non-ferrous metals show no extension of tool life.

On production steel parts, steam treatment is an economical way of cleaning prior to plating. In some applications the corrosion resistant quality of the oxide coating has been beneficial. The speaker mentioned cases of improved machining qualities attributed to the oxide's ability to retain oil.

Cast iron parts improve in wear resistance. Powder iron compacts gain in hardness and corrosion resistance. Annealing in steam atmosphere eliminates pickling between cold working operations on brass, bronze and copper parts.

Tool engineers, Mr. Spangler declared, should take active interest in the selection of heat treat equipment and be thoroughly familiar with treatments available, in order to plan production process methods to the best advantage.

Thomas C. Bradford of Worcester, a member of the National Membership Committee, spoke briefly during the meeting.

It was announced that Arthur R. Diamond of Philadelphia chapter had been appointed vice-chairman of the National Education Committee.

T. J. Donovan, Jr., national director, reported on the semi-annual directors meeting at Detroit.

Foster Crayton offered the invocation before dinner.

Hoagland Gives Dover's First Technical Lecture

Dover, N. H.—First technical meeting of the recently chartered Granite State chapter was held November 14 at the American House, with Frank O. Hoagland, master mechanic at Pratt & Whitney, West Hartford, Conn., as guest speaker.

Following dinner and a business meeting, the audience of 53 members and guests heard Mr. Hoagland discuss "Jig Boring and Jig Grinding Machines." In relating the growth of techniques for producing to close tolerances, he touched on the history of standards.

Paul Deschenes, program chairman, introduced Mr. Hoagland and invited membership comment on programs, to guide his committee.

John A. Woodman, chairman, welcomed the group and introduced the following new members: Paul St. Laurent, Northeastern Engineering Co., Manchester; Keith Richardson and Gerritt Miedema, Kidder Press Co., Dover; Guy Heeney, Norcor Mfg. Co., and John Bath, J. B. Mfg. Co., Portsmouth; Gerald Morse, Essex Tool & Die, Inc., Salisbury, Mass.; Lovell Hindle, General Electric Co., Somersworth; Edmund Stevenson and Tony Abrahamovich, Scott & Williams, Laconia.

Several guests also were presented. Mr. Woodman read congratulatory

messages from H. L. Tigges, Society president, and from Boston and Portland (Me.) chapters.

Chairman Woodman appointed as committee heads: Carmel P. Radwan, public relations; James W. Hodgson, education; Harold F. Perkins, constitution and by-laws; John F. Kenney, membership; Donald W. Pease, standards; Charles M. Nystedt, editorial, and Paul L. Deschenes, program.

George Mucher, chief engineer of the Clarostat Mfg. Co., won the complimentary dinner award.

Members Are Guests At Evansville Social

Evansville, Ind.—November 13 meeting of Evansville chapter was "on the house." Upon presentation of a current membership card, members were admitted as guests of the chapter. The evening was devoted to a social program headed by Joseph Halbig of Moll Tool and Die Co.

Following dinner at the Alpine House, William Henn of Stippler Tool & Supply Co. led the group in singing.

Bob Hargrave, a onetime Notre Dame quarterback now connected with the Citizens National Bank of Evansville, spoke on "big-time" football. At the close of his talk Mr. Hargrave presented motion picture highlights of the 1948 Notre Dame football season.

Another film, "In Balance," produced by Burroughs Adding Machine Co., also was shown.

William Henn leads group singing at the dinner party Evansville chapter gave for members.

The Dixie Liners, a quartet composed of Arnold McPhee, James Negley, Robert Evans and George Viehe, entertained with barber shop harmony. About 75 members and guests attended the meeting.

Says Hydraulic Cylinder Good for Million Cycles

Poughkeepsie, N. Y.—As Eugene V. Barkow, project engineer for the Industrial Division of Electrol, Inc., Kingston, N. Y., detailed for Mid-Hudson members the basic parts of an

hydraulic system, he illustrated with an actual working model. Mr. Barkow was the technical speaker at the November 14 meeting of the chapter.

Major units described included the reservoir for the fluid, pump, relief valve to regulate pressure, directional control valve which guides the fluid to the proper line, and the actuating cylinder providing motion or power in both directions.

Among other parts discussed by Mr. Barkow were the three-way valve for single-action cylinders requiring gravity or spring action for return of the fluid, the fluid motor, an electrically operated four-way valve, and a special valve for remote control positioning.

Viscosity of the oil, he observed, may produce a great change in the system. An hydraulic oil similar to SAE-10 is most often recommended. An inferior grade tends to clog pressure lines and valves, causing trouble in the functioning of the system, he warned.

For a cylinder on machine tool applications, the speaker quoted one million cycles as good performance. After this, repacking may be necessary. Valves give about a half-million cycles before repacking.

Prior to the technical talk, Robert Slocum, boy scout field executive, spoke on scouting in Dutchess County. Ellis W. Thorp, chapter chairman, presided. Approximately 60 members and guests were present.

Design Tool for Job For Carbide Success

Washington, D. C.—Carbide can be used more advantageously for tools by designing for the particular job, R. A. McLaughlin of Allegheny Ludlum Steel Corp. told Potomac chapter while speaking November 9 in a meeting at Dodge Hotel.

Nature of the cut and material of the job, he added, determine the type of carbide required. Some long chip materials such as steel tend to crater a tool. For cutting these metals tantalum and titanium are recommended.

The cobalt used as a binder in sintering carbide is another factor in selecting tools. A high cobalt content provides a tough, soft carbide. Less cobalt makes a harder, more brittle substance.

Mr. McLaughlin pointed out carbide's hardness even at very high temperatures; its corrosion resistance, elasticity, and high compression factors. But it has some undesirable characteristics—low tensile strength, low resistance to thermal shock, and brittleness.

Compared with steel carbide has a much lower coefficient of expansion. This makes it necessary to sandwich a 0.005 in. layer of copper between the

carbide and the steel tool body when silver brazing is used for cementing.

The discussion period brought out the following points: Carbide tools should be run faster to break down the metal "build-up" on tools. Plenty of coolant should be used, except on interrupted work. For best results the tool should be pre-dulled with a carbide stone.

Depth of cut is determined by the machine and power available. Stainless steels do not crater. Aluminum should be cut at the fastest speed available.

Asked about micro-finish on carbide cutting tools, Mr. McLaughlin doubted its value.

A technicolor film, illustrated his description of the development and manufacture of carbide.

Among guests at the meeting were Barney Miller, Eastern seaboard representative of Allegheny Ludlum Steel Corp., Michael Morton, chief engineer of the U. S. Naval Gun Factory, and Theodore Meyers, newly appointed master mechanic of the Naval Gun Factory tool shop.

Sewage Plant Engineer Describes Operations

Los Angeles, Calif.—Engineering aspects of the $41 million Hyperion Sewage Treatment Project was the subject G. A. Parkes, chief engineer in charge of operations at this plant, presented to Los Angeles chapter, November 9.

Wayne Ewing (right), Los Angeles chairman, welcomes G. A. Parkes, chief engineer of the Hyperion Sewage Treatment Project, who addressed recent chapter meeting.

Mr. Parkes illustrated with slides the diversified activities in an operation of this type. Highlights included a review of the progress of sanitation through the ages to the modern treatment plant of today. By-products of the plant are gas for diesel engine fuel, and commercial fertilizer.

The question and answer period following the talk gave everyone present an understanding of sanitation problems.

Obituary

Carroll M. Aument

Carroll M. Aument, sales engineer for Kenneth F. Thompson Co., West Hartford, Conn., passed away November 25 after an illness of about two months. Mr. Aument was in his 63rd year.

A graduate of the Strasburg, Pa., high school, he studied electrical and mechanical engineering at Drexel Institute of Technology, Philadelphia.

For nearly 30 years he was associated in engineering and executive capacities with automotive and aircraft firms such as Mack Trucks, Inc., Fokker Aircraft Corp., The Glenn L. Martin Co., and Sikorsky Aircraft Co.

In addition to his membership in Fairfield County chapter, ASTE, Mr. Aument was an associate fellow of the Institute of Aeronautical Sciences.

New York Entertains Ladies at Dinner Dance

New York City—On November 6 Greater New York chapter took over the Tavern-on-the-Green in Central Park for its annual dinner dance.

As guests entered they were serenaded by the Taag Design Trio, composed of Hugo Aglietto, George Hermann and Irving Brand.

Carl Kertesz, chapter chairman, welcomed the gathering and introduced T. J. Donovan, Jr., of Philadelphia, ASTE national director. Mr. Donovan gave his well-known "silver dollar" show a novel twist. One place at each dinner table had a tall, slim tumbler. The lucky holders of these glasses had a shining "cartwheel" dropped into them. The glasses seemed to multiply so amazingly that the emcee ran out of coins and had to substitute greenbacks. Mr. Donovan also distributed the door prizes.

Egan Made Sales Manager

Chicago, Ill.—Harry Egan, former third vice-president of Chicago chapter, has been named general sales manager of Sheldrick Mfg. Co., Upper Sandusky, Ohio.

Until his promotion Mr. Egan was Chicago district manager for Sheldrick. In moving his residence to Ohio, the ASTE officer resigned his chapter post.

Duff Promoted by Morse

Cleveland, Ohio—Morse Twist Drill & Machine Co., New Bedford, Mass., has appointed C. F. Duff district manager for Ohio and Indiana.

A Cleveland chapter ASTE'er, Mr. Duff was formerly Cleveland representative for his company.

Abstracts of

Foreign Technical Literature

By M. Kronenberg

England: A paper presented before the Institute of Mechanical Engineers in October 1950 by E. A. Cooke on form grinding by mechanical and optical methods was called a "revolutionary idea" by one of those who participated in the discussion of the paper. The address including discussion was published in the November 10 issue of "The Engineer."

Until some four years before the beginning of World War II there were few machine tools specifically designed for the purpose of grinding two-dimensional profiles. One design was produced by the Loewe Works, Germany; another was made by Studer in Switzerland. These machines were based upon mechanical and optical principles, singly or in combination, but all of them made use of a large master from which a reduction was copied. In some cases the master was an enlarged drawing, in others an enlarged metal template.

The time required for producing the enlarged metal templates, or also drawings, was often prohibitive for using such grinding machines when only small quantities were involved. The Royal Small Arms Establishment at Enfield, England, was in need of profile grinding machines which would be capable of generating geometric forms directly from basic data in addition to working from enlarged masters.

The author's company developed such a machine which uses as a master a photographic copy of the same size as the actual workpiece. A particular feature is the avoidance of optical interference between the image of the workpiece and the grinding wheel. This is accomplished by eliminating the grinding wheel from the projection system, as described in detail in the publication. It is claimed that the machine will substantially supplement the number of toolmakers who are always at a premium in times of national emergencies. Valuable information will also be found in a previous publication on this subject—before the present machine was completely developed—in the Proceedings of the Inst. of Mech. Engineers, Vol. 158, pp 84 ff and in the discussion of the paper itself.

France: Precision in production is also the topic of many articles published recently in French technical magazines.

M. Blanding, in an article "Utilization of Jig Boring Machines" published in the August 1950 issue of "Revue Generale de Mecanique," discusses the development of accuracy required for producing modern machinery. He indicates that in the year of 1900, measurements were considered accurate when the dimensions could be determined to about 0.004 in., in 1915 measurements were required to 0.0004 in., in 1935 the accuracy was increased to 0.00004 in. and in 1945 accurate measurements down to 0.000004 in. were desired.

This increase in precision requires substantial research in thermal expansion, vibration and deformation of the machine tools, particularly jig borers. The special type of cast iron used by the author's company is discussed.

Jig borer attachments for radial drills are discussed in an article published in "La Practique des Industries Mecaniques," August 1950. These French-made attachments, it is claimed, differ from American attachments. They are used to facilitate jig boring in cases only when small quantities are involved and where the purchasing of a special jig boring machine would not be justified from a cost standpoint. A comparison of the time required for jig boring with and without attachment shows the economical advantages of the attachment under the given conditions.

In connection with the often discussed replacement policy for machine tools in the United States it is interesting to note that J. Petri in an article in "La Technique Moderne" of May 1950 considers these problems from the standpoint of the French industry. In "La Machine Moderne" of August 1950, dealing with the machine tool industry in Japan it is indicated that the development of this industry in Japan began in 1937 and that 60,000 units were produced in 1943 as against 8,000 in 1948. At present the production has increased to more than 27,000 units per year with an export value of $122,000,000. The export is expected to increase to $325,000,000 by 1955, a value which seems to be very high in comparison with the export of machine tools from this country.

Germany: A report on an international meeting on Gear Research is given in "Zeitschrift des Vereins Deutscher Ingenieure" of September 11, 1950 by G. Niemann and H. Glan-

bitz. The article covers the various papers presented under the sponsorship of the Institute of Machine Elements of the Engineering College of the University of Brunswick, and includes discussion on dynamic forces acting at the teeth of gears, their elastic deformations, the resistance to flank wear, galling, accuracy of tooth profiles, heat treatment of gears and lubrication, and concluding with a short comment on the cold rolling of gear teeth.

Deep freezing in lieu of heat treatment of high speed steel tools is the topic of an investigation carried out by W. Hauffe and published in "Werkstatt & Betrieb" of April 4, 1950. The good results obtained with deep freezing are attributed to the finding that almost all austenite is transformed into the harder and more wear-resistant martensite.

K. Krekler, in an article published in "Zeitschrift des Vereins Deutscher Ingenieure" of October 21, 1950 discusses "New production methods for forging, welding and machining of parts used in power plant industries." Valves and other parts such as accessories for boilers, etc. are often made of cast iron, cast steel or stainless steel, with occasional defects in the castings which cannot be detected from the outside. They reduce resistance and can be dangerous in this field of application. In addition, difficult machining operations are sometimes required due to complex part design.

The forging method described employs steel with 0.2 percent C and 0.4 percent Mn, at a tensile strength of about 75,000 psi. Since the high carbon content permits a high forging temperature and a good flow of the material, it is possible to produce workpieces of homogeneous structure and good machinability. Complex pieces are redesigned and divided into simpler parts which can be forged, machined and welded together in order to obtain the original design. Numerous examples given in the article indicate that the so-called "Ellira-Welding Process" which was developed in Germany during the war and described in 1941 in the same magazine, has made great progress in replacing arc welding. The welds are made in such a way that air can be eliminated, whereby "X-ray proof" welds are obtained and craters avoided.

L. Bergman in an article in "Zeitschrift des Vereins Deutscher Ingenieure" of Sept. 1, 1950 gives a review of the "Application of supersonic methods to testing of workpieces." His paper deals with the developments in Germany, England, the United States and other countries. The bibliography, winding up the article, covers international publications.

North East West South in Industry

John G. Bucuss, general manager of Strapping Division, **Acme Steel Co.,** was elected president of the Materials Handling Institute for 1951 at the annual meeting. Mr. Bucuss, who has been with Acme Steel for 32 years, has served previously as director, second vice-president and first vice-president of the Institute.

The appointment of **Alexander Zeitlin** as vice-president of **Hydropress, Inc.,** and of **Loewy Construction Co., Inc.** was announced by the president of the companies. Mr. Zeitlin will be in charge of the rolling mill and heavy press program recently initiated by the government.

Separation of the Ingersoll Steel Division of **Borg-Warner Corp.** into two independently operated manufacturing units has been announced. One unit, **Ingersoll Steel Division,** with steel mills at New Castle, Ind., will be headed by **Harold G. Ingersoll** as president and general manager. The other division, with plants in Chicago and Kalamazoo, Mich., will be known as the **Ingersoll Products Division** and will be directed by **Robert S. Ingersoll** as president and general manager.

Robert A. Mitter has been appointed sales manager, Gear Coupling Division, **Sier-Bath Gear & Pump Company, Inc.** Mr. Miller previously was advertising manager for the company and assistant sales manager of the Coupling Division.

Edmund J. Klonowski has been made general manager of the Punch Division of **The Pivot Punch and Die Corp.** now under an extensive expansion program. Mr. Klonowski, who reportedly becomes one of the youngest general managers in the punch industry, brings more than 14 years experience in die designing to his new position.

Recent personnel announcements from the **Borg-Warner Corp.** named **Mathew Keck** as a vice-president of the company; and **Harry L. Emerson** as vice-president in charge of manufacturing of the Rockford Clutch Division. Mr. Keck, who has been with the firm since its formation in 1928, will continue in his post as treasurer, while Mr. Emerson also will continue in his duties as works manager of the Rockford organization.

Ernest B. Meynard has been appointed assistant sales manager of **Buckeye Tools Corp.** Mr. Meynard has been associated with Buckeye Tools since 1942.

Earl C. Hughes, vice-president and secretary of **Bay State Abrasive Products Co.,** was re-elected president of the Grinding Wheel Institute, at that society's recent annual meeting in Buffalo.

Sintercast Corp. of America has moved its office, laboratory and production facilities from New York City to larger quarters in Yonkers, N. Y. Activities of the firm now are divided into two specialized categories: research into and development of powder metallurgy techniques and alloys and production of standard and special-purpose powder metal parts.

The appointment of **Wilbur E. Combs** as product manager for the L. H. Gilmer division of **United States Rubber Co.** has been announced. Mr. Combs formerly was assistant manager of U. S. Rubber V-belt sales.

The **Hartford Special Machinery Co.** has announced the appointment of **Robert A. Bode** as sales manager and **J. James Tasillo** as assistant sales manager for its line of drilling and tapping machines.

During a recent election, **William J. Greene,** vice-president and director of sales of **The L. S. Starrett Co.,** was made a director of Motor Equipment Manufacturers Association for a three year term.

H. S. Sizer, assistant to the director of design, **Brown and Sharpe Manufacturing Co.,** has been elected to the board of directors of the American Standards Association. Mr. Sizer will serve a three-year term of office.

Milton G. Peck has been appointed sales manager for the recently introduced line of powered hand trucks of the Clark Equipment Co. Mr. Peck formerly was associated with Yale and Towne in Philadelphia.

C. Carlisle Tippit has been named general purchasing agent of The Reliance Electric & Engineering Co. Mr. Tippit formerly was manager of the order and planning department. Those duties are now assumed by Walter H. Behnke of Reliance's engineering department.

J. Oliver Black, formerly president, has been named chairman of the board of Peninsular Metal Products Corp., and Robert W. Burgess, who previously served as vice-president, was elected president. Roy T. Mitchell, president of the Sanian Corp., was made a director.

W. C. Dillon & Co., Inc. now occupies its new general office and laboratory building, 1421 S. Circle Ave., Forest Park, a suburb of Chicago. The present area makes available approximately 15,000 square feet of working space for the company's engineering and research development activities.

According to recent announcement, the Johnson Engineering and Sales Corp. of Rockford, Ill., has been purchased by the Porter-Cable Machine Co. Production facilities of the purchased firm are being moved to Syracuse.

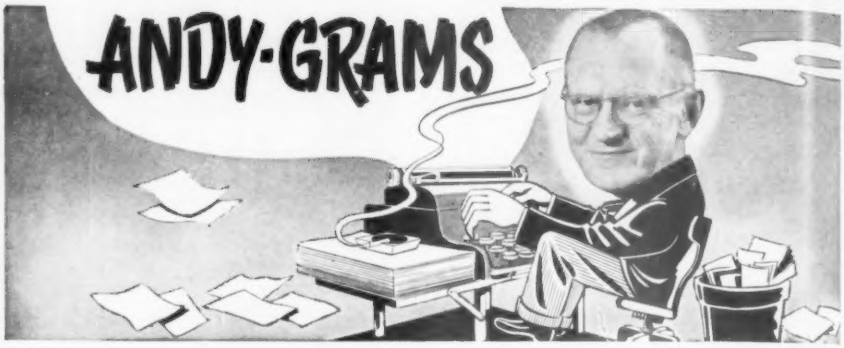
Harold K. Beck has been appointed a commercial vice-president in addition to his present post as manager of the Washington office of Worthington Pump and Machinery Corp. Mr. Beck has been associated with Worthington for the past 25 years.

Joseph T. Ryerson & Son, Inc. has moved into its recently completed steel-service plant and office building, 3475 Spring Grove Ave., Cincinnati. The new unit provides almost four acres of floor space for the company's operations.

Coming Meetings

Jan. 15-18, second Plant Maintenance Show and conference: Auditorium, Cleveland.

Jan. 18-20, seventh annual National Technical Conference, Society of Plastics Engineers, Inc.; Hotel Statler, New York City.



For the record, I am foreign born, native of a land which like ours, has learned to keep peace with its neighbors and with which, happily, we Americans have yet to have a serious quarrel. I say 'we Americans," because I consider myself as staunchly American as any Yank whose forebears came over in the Mayflower or the Kalmar Nyckel. That too, is for the record.

The ship that brought me over, just before the turn of the century, carried a polygot load of emigrants—Germans and my fellow Scandinavians; Britons and Gaels; Franks and Italians; Slavs and Levantines—that, altogether, constituted but a ripple in a tidal wave of emigration sweeping toward America, land of opportunity.

At the time, the world was just entering the machine age, with America in the van. Sails predominated over steam on the seas; the "talking machine" was a (then) modern miracle; the electric light a dull glow; the movie an incipient flicker; the "horseless carriage" an impractical (sic!) toy for the rich; flight and wireless but figments of inventors' dreams. But in the brief span of a normal lifetime, these things were to completely revolutionize the design for living.

And so they came, these immigrants, wave after wave, intellectuals and illiterates, the skilled and the unskilled, the thrifty and the wastrels, the many making the most of opportunity and thereby creating wealth and promoting culture to the end that the masses of Americans were to enjoy a standard of living denied to all but the wealthy in foreign lands. And where the few were to requite largess with subversion and treachery, the many were to give returns in unswerving loyalty.

America was—and is!—a land of opportunity, with the rewards only limited by personal initiate and the will to work—with, it may be added, a bit of luck thrown in. Speaking for myself, America has been good to me. True, I didn't find the streets paved with gold nor did I swap my homespuns for silken raiment, as Mor Britta prophecied on the eve of departure. Rather, there were lean years of hard work, with the rewards coming at the right end of life. I'm grateful, and if not entirely contented it is only because there is so much yet to be done—especially so since we are again in a state of national emergency.

In view of all this, one may reasonably wonder why governments of foreign nations whose sons once flocked to our shores, here to find haven and success, should now impute to us sins which, in the main, we have not committed. Has the "capitalism" which once attracted the poor of foreign lands now become a crime? Has freedom-loving America become so imperialistic, such a threat to the peace, that foreign powers must needs try to align the world against us? The facts refute the charges.

Now, I've given you this bit of preamble for a reason. Foreign born, I have mingled with people of all races; as a result, have acquired faith in the inherent goodness of the common people. I believe that I have also come to understand people, even as Yank flyers shot down in the jungles came to sense the innate friendliness and compassion of Fuzzie-Wuzzies whom, previously, they may have regarded as unregenerate savages.

And right there may be the nub of our trouble. For in the main, we Americans have not learned to understand people, least of all foreign peoples. We are authorities on bridge and canasta; have such encylopaedic knowledge of sports that we can cite the batting averages of baseball stars from Ty Cobb to Babe Ruth, if that is the order (I wouldn't know); and ring records of every pugilist from John L. Sullivan to the latest contender.

We revel in escapist literature and movies—in which, until recently, the "heavies" have always been foreigners—and so lose touch with realities; in silent groups glue our eyes to television sets and so lose the fine art of conversation. Commentators—of which no two agree—confuse rather than shape our thinking and so distort our views of foreign lands. On top of that, we elect men to office on waves of popularity rather than on their quali-

fications, then wonder why they go abroad to try the patience of our friends—of which, fortunately, we still have plenty.

That's stretching it a bit, I'll admit; however, I am merely picturing us as others see us. Not our enemies, who would make white black, but our friends in foreign lands who, while mildly critical, are also loud in their praises of our many good qualities.

In truth, however, we are inclined to brag too much—not without grounds, perhaps, but too much for good public relations. We flaunt our wealth before the have-nots, and so create jealousies; vaunt our machine civilization and forget that high cultures—in the Orient, India, Egypt, the Levant—have anteceded ours by millennia; boast of our technical know-how and inventive genius the while entirely overlooking the fact that many of the things we mass produce originated abroad. Unlike our chief adversary of the moment, we weren't first in all things.

Now, we've got to come down to earth and learn to understand foreign peoples, so that thereby we foster friendships instead of suspicion of motives. For it is not enough that we shower gold and goods on our neighbors, which some have come to regard as "gifts borne by the Greeks"; we've got to penetrate into their hearts so that they, in turn, learn to understand us. In brief, we must strive to level all barriers of misunderstanding, for thereon—far more than by force of arms—rests our hope of survival not only as a free nation but as a force for world peace.

As for this propaganda against "capitalism", who of us owning two suits, a home and a car and having a few dollars in the bank or owning a few shares of stock is not a capitalist? And is that state any more onerous than being allotted a parcel of land, which one may not own, under a collectivist system? Perish the thought!

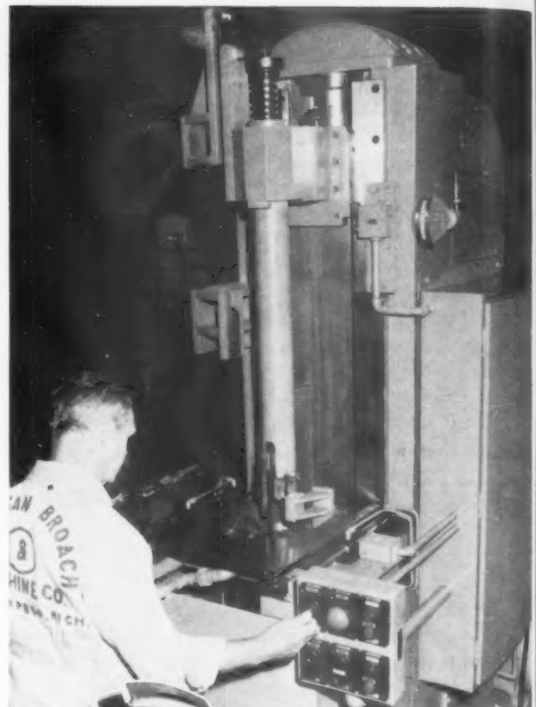
That, then, is my message to my fellow Americans. To our friends in foreign lands, and especially to those caught in the orbit of an unfriendly power, I suggest that you disregard propaganda and weigh our good points against our faults. That done, you will not find us wanting. Or, if you prefer, judge us by your kindred in our midst, the staunchly loyal Americans-by-choice whose hearts yet warm at thought of their motherlands. For there is the tie that binds.

Very humbly yours

Andy

Fixed broaches + automatic cycle } = HIGH PRODUCTION

by broaching the *American* way



PROBLEM To broach six external lugs on a stamped transmission clutch flange part in one pass.
(The previous broaching set-up consisted of three fixed broaches on the machine slide, a receding table and an indexing type fixture. Three lugs were broached in one pass, the table receded, the fixture indexed 180° and the opposite three lugs broached. This did not meet production requirements nor accuracy as the receding table and index fixture allowed too great an accumulation of error.)

SOLUTION A special American 10 ton, 42 inch stroke vertical broaching machine arranged to push the part past six stationary roughing broaches in one pot which nibble and adjustable finishing broaches in the second pot which shave the part. A 3 to 4 times hourly production increase with the part held within the tolerance was the results of this ENGINEERED PRODUCTION broaching operation by American.

OPERATING CYCLE: The operator first loads a part and starts the automatic machine cycle with dual push buttons. The transfer slide moves forward to broaching position and automatically starts the main ram down. Fastened to the ram is a push bar which locates the part and pushes it through the stationary broaches. The part is automatically discharged at the end of the stroke. The automatic transfer slide returns to loading position allowing the operator to reload while the push bar is returning up.

American can give you this Greater Production Economy

This is only one example of how broaching the American-way solved this manufacturer's problems. Because American manufactures a complete line of broaches, broaching machines and fixtures, they can help *you* engineer your job *completely* to obtain the greatest production economy. Start American working for you by sending a part print or sample and your hourly requirements.

Write for Circular 300 showing American's complete line of hydraulic surface broaching machines.

AMERICAN

***American* BROACH & MACHINE CO.**

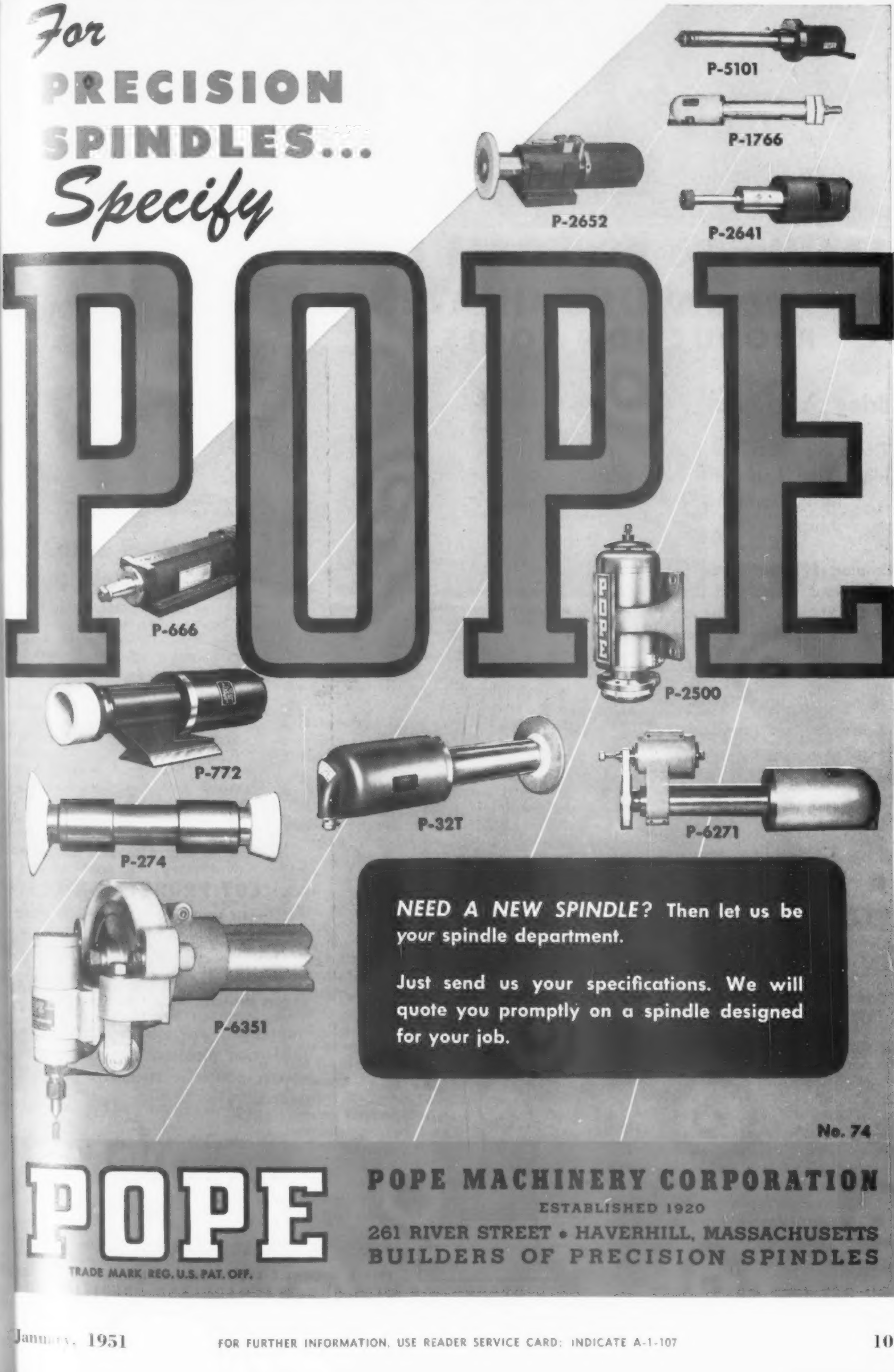
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-1-104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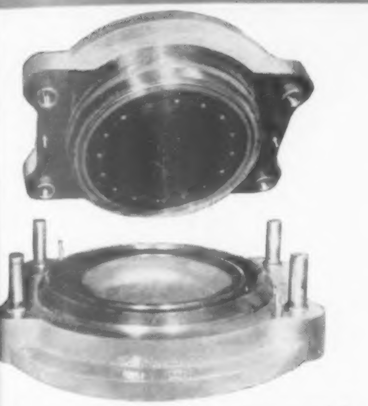
Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor: Bethlehem Steel Export Corporation*



A-H5 solved a distortion problem and increased the production of large dies for blanking tank heads.

A-H5 Cures Distortion of Large Blanking Dies

A manufacturer of water-heaters couldn't seem to prevent an excessive amount of distortion in large-diameter forged rings of oil-hardening steel for blanking out heads for water tanks. Our distributor recommended A-H5 (5 pct chrome, air-hardening) tool steel because of its greater resistance to distortion . . . and its added features of high wear-resistance and toughness.

After A-H5 had been used for one year, the records showed that besides licking the distortion problem, the air-hardening grade had made possible a nice increase in production . . . and the cost of the tool steel was no greater than before.

A-H5 is an economical, general-purpose grade—especially for tools and dies that call for long wear, high resistance to distortion, and for extra safety in hardening.

Our Tool Steel Engineer Says:

There are good reasons for annealing tool steel

Most tool steel bars are furnished in the annealed condition. The annealing is done for two reasons:

1. To remove the stresses in the as-rolled or as-forged bars which could otherwise lead to cracking.
2. To produce the lowest possible hardness consistent with the best machinability.

During the annealing operation, care must be used to avoid excessive scaling and decarburization. The bell-type, controlled-atmosphere furnaces used in our tool-steel mill are ideal for this purpose. We can far surpass the results obtained with ordinary annealing equipment.

TOOLS MADE OF 67 CHISEL WITHSTAND BRUTAL SHOCK

67 Chisel, used in this punch, absorbs plenty of shock in the forming of parts from 0.185-in. sheet steel.

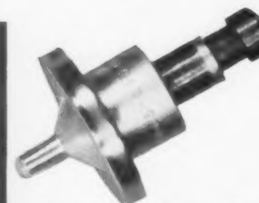
As its name implies, 67 Chisel is primarily for shock tools . . . but chisels account for only a small proportion of its many applications. This chrome-tungsten steel has high shock-resistance, good red-hardness, and it is readily carburized for high wear-resistance.

67 Chisel is first choice for master hobs used in hobbing molds for plastics and die-casting work. It's often used for punches, swaging dies, calking and beading tools . . . heavy shear blades for cold work and for hot work up to 1000 F . . . and various shock and hot-work jobs such as studs and bolts for elevated temperatures, drop-forge die inserts, piercers, headers, and forming tools.

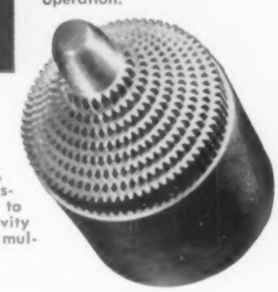
Carburizing produces a high surface-hardness that's reinforced by a tough, shock-resisting core. 67 Chisel has very high impact properties—about 175 ft-lb. That's really tough!

67 Chisel is a mighty versatile grade to keep in mind when you need tools that will stand up under heavy shock or high pressures; and it's especially recommended for tools having deep recesses, corners, slender shanks—wherever great strength is needed. You'll find it's an easy steel to machine and heat-treat.

67 Chisel is stocked in many sizes and sections in our mill depot . . . also by distributors of Bethlehem Tool Steels in principal cities.



This die, used for "dimpling" aluminum aircraft skin, is made of 67 Chisel and is heated electrically to 600 F so as to stress-relieve the aluminum during the operation.



Made of 67 Chisel, this intricate master hob is used to hob a mold cavity for die-casting a multiple gear.

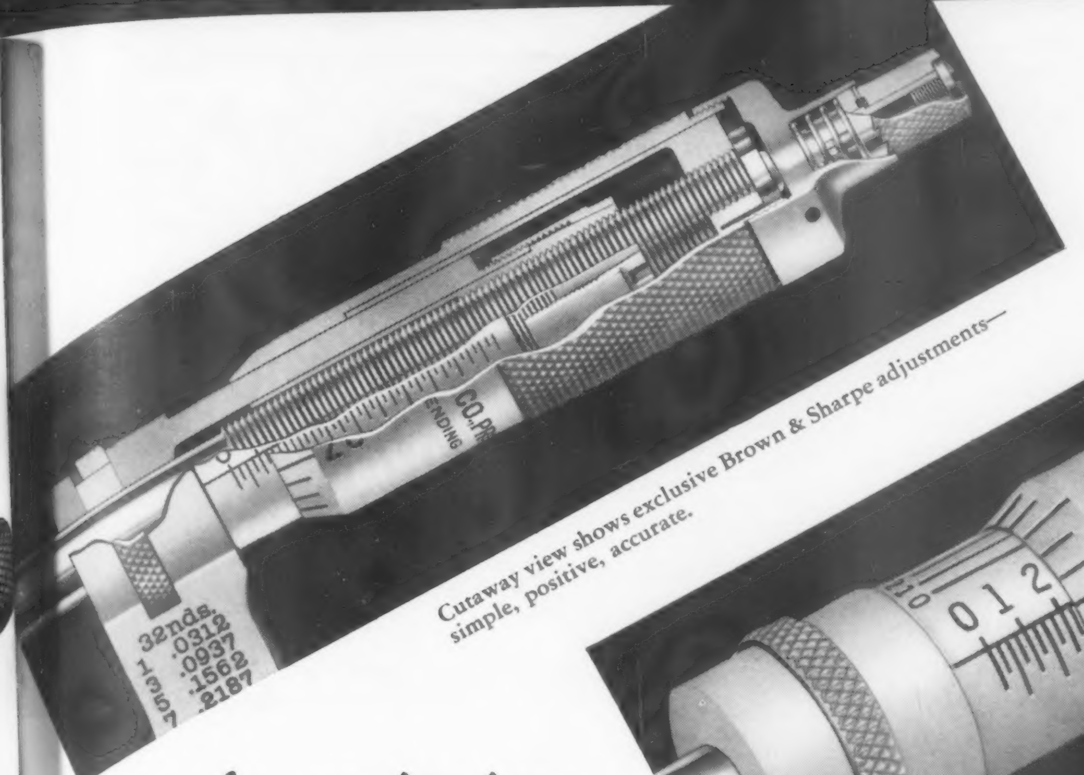
Choose Tool Steel To Fit the Job

Shop men sometimes have deep-rooted ideas about tool steel that just aren't based on facts. The other day, for example, we saw a milling cutter made for a rather unusual machining job. The toolmaker had selected high-speed steel, figuring it would last longest because it was the most expensive and the most highly alloyed grade.

He made a poor choice, for the high-speed cutter produced only 18 pieces before it failed. One of our tool-steel engineers was called on to explain this disappointing performance. He recommended Bethlehem XX Carbon Tool Steel . . . and the first cutter made from it finished 175 pieces.

It's just another instance of the longer tool life made possible by selecting the right grade of tool steel for the job. Our technical staff is always ready to assist in selecting tool steels and in recommending the best methods of heat-treating.

Bethlehem ULTRASONIC TESTED **Tool Steel**



Cutaway view shows exclusive Brown & Sharpe adjustments—simple, positive, accurate.

Large diameter thimble provides wide divisions. Easy-reading black graduations and figures on rust-resistant dull chrome finish.

An exclusive combination of advanced features!

Never before has a line of micrometers offered such an outstanding combination of advanced features! Improvements throughout the new Brown & Sharpe Micrometers now contribute higher performance to every essential of micrometer service . . . readability, accuracy, ease of adjustment, durability.

Notice the widely-spaced divisions, black graduations and dull chrome finish . . . for easy, accurate reading. Observe the integral spindle and screw with simplified thread adjustment and longitudinal adjustment of thimble on screw. Consider what the long-wearing carbide faces and one-piece stainless steel spindle and screw with hardened and ground threads mean to durability!

Only by actually seeing and holding one of these new micrometers in your own hand can you appreciate all the advantages of these many new features. See them at your hardware store or tool supplier's. Write for illustrated folder describing the completely new line of Brown & Sharpe Micrometers. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

Long-wearing carbide measuring faces . . . another Brown & Sharpe contribution to enduring accuracy.

We urge buying through the Distributor

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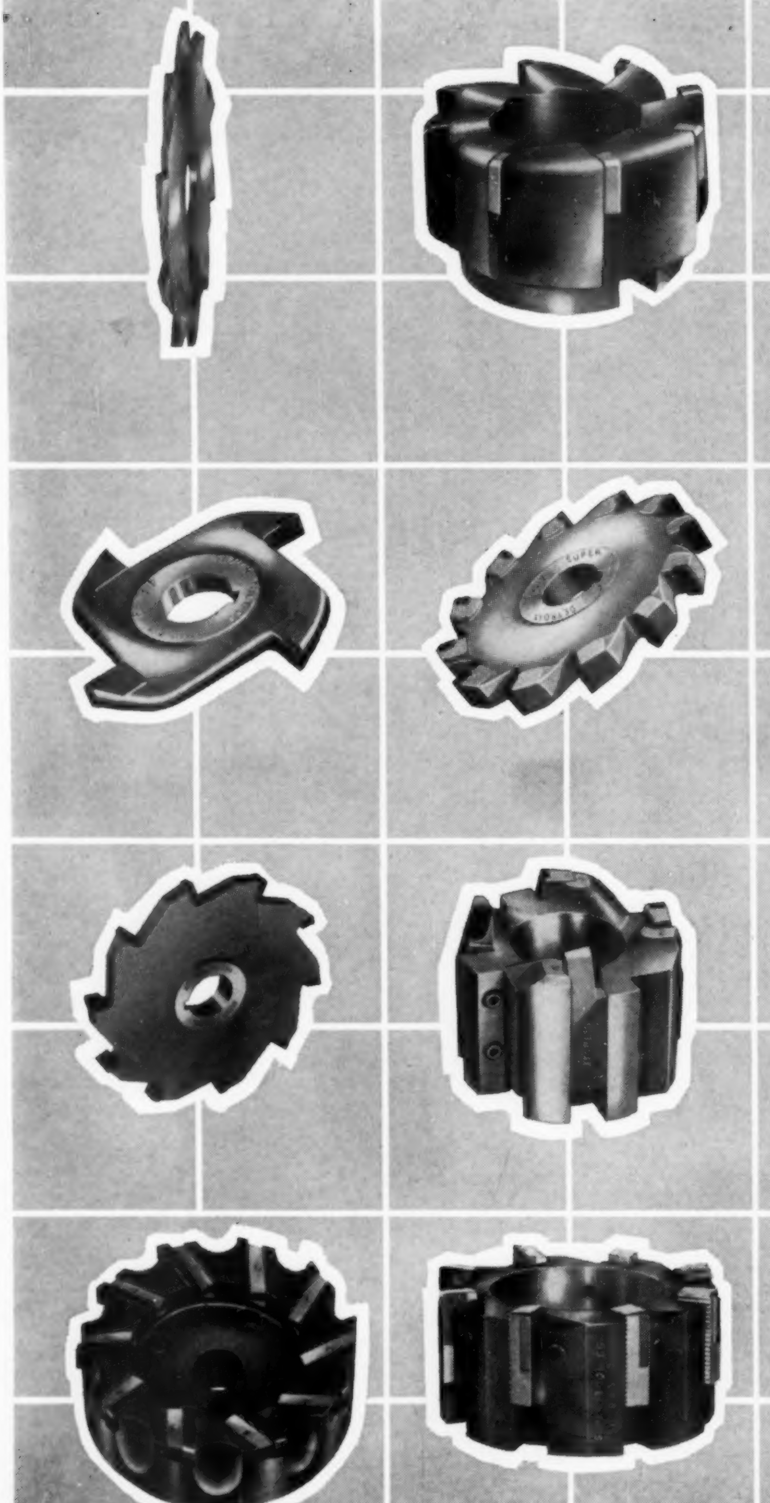

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MILLING CUTTERS

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For machining aluminum, cast iron, steel, etc. We also design and make special carbide cutters to your requirements.

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Gear tooth crowning (Elliptoid Tooth Form) is used for just one purpose—to prevent "end bearing," which is a concentration of operating load at the end of the tooth where it is most vulnerable to failure.

Crowning is the only way to prevent end bearing because with any gear assembly it is impossible to maintain accurate gear alignment under all conditions of loading. Shafts, bearings and mountings are all elastic. Even the slightest deflection will cause misalignment and end bearing in gears with conventional teeth.

Many of the leading automotive gear plants have standardized on crowning to raise the factor of safety of gear teeth and to reduce operating gear noise. Crowning does both successfully.

Crowning accomplished on Red Ring Gear Shaving Machines is a precision machining operation by which the maximum amount of crown is always under positive control. Tolerance control is indicated by a typical routine check of a lot of 4000 gears having the following specifications: 1″ face, 18 teeth, 13.5 Nor D.P., 20° Nor P.A., 27° H.A. and .0003″ to .0005″ crown. An adequate check failed to reveal any unit outside the .0002″ tolerance on crowning.

WRITE FOR BULLETIN S49-5 FOR A MORE DETAILED DISCUSSION OF GEAR TOOTH CROWNING

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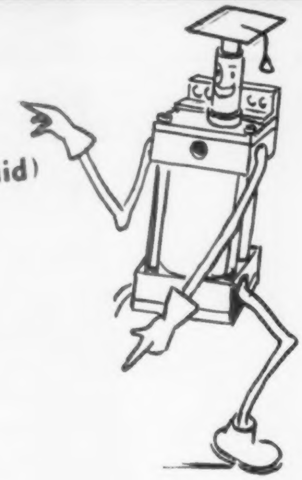
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

BOOST
80 PSI AIR
(Input Range: 40 to 3000 psi Air or Fluid)

TO . . .
2000 PSI HYDRAULIC PRESSURE

(Output Range: 200 to 10,000 psi Fluid)



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From ordinary plant air line pressure, Miller Boosters produce hydraulic pressures (from 200 to 10,000 psi) for driving one or more hydraulic work cylinders simultaneously at from 30 to 450 strokes per minute. Ordinarily, the booster operates one stroke for each stroke of the operated work cylinders.

Used in place of conventional type hydraulic pumps, Miller Boosters save space and weight, permit convenient portability and are easier and less costly to install, operate, and maintain. Also, they hold pressure *indefinitely —without the motion and heat generation of ordinary pump circuits.*

Used in place of air cylinders, the booster driven hydraulic work cylinder, which can do the work of an air cylinder ten times as large and heavy, saves space and weight at point of application of cylinder thrust—since the booster itself can be mounted separately—away from the hydraulic work cylinder—and either on or off the equipment or machine.

In many installations, the popular Miller Dual Pressure "Air Miser" Booster *saves up to 95% of the air* normally consumed by direct-driven air cylinders.

A wide selection of sizes, pressure ratios and mounting styles are available for the first time at low cost on a normal delivery schedule because Miller Boosters are built up from stock Miller standard cylinder parts to eliminate costly designs, patterns and castings.

Especially Recommended for . . .

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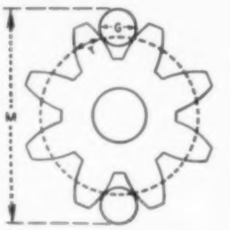
ST. LOUIS and OTHER AREAS.

THE *Van Keuren*

simplified GEAR MEASURING SYSTEM



is the most accurate and economical method of measuring tooth thickness of external and internal spur gears, helical gears and involute splines.

External Spur Gear

STANDARD SIZES OF WIRES ARE AVAILABLE FROM STOCK

1.728"/DP for external spurs
1.44"/DP for internal spurs and 30° splines
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1.68"/DP tentative alternate series

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This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.
It presents for the first time in history a simple and exact method of measuring screws and worms with wires.
It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.
Copies free upon request.

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THE *Van Keuren* CO., 174 Waltham St., Watertown, Mass.

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Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Measuring Wires • Carboloy Plug Gages.

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LESS DOWN TIME, MORE PRODUCTION FROM PUNCH PRESSES FED BY LITTELL DOUBLE AUTOMATIC CENTERING REELS

Vital minutes are saved, with practically no down time for coil replacement, when a Littell Double Reel uncoils stock to the punch press. The idle side of the reel is loaded while the other side pays out. When a coil is used up, the operator simply lifts the hub lock pin, then swivels the reel 180°, thus placing the reserve coil in press feeding position. The change-over is complete in a few seconds. Like Littell Single Reels, Littell Double Reels combine balance that means smooth running accuracy with rugged malleable iron and steel construction that assures year in, year out dependability.

FOUR SIZES

No. 3 . . . . for coils up to 300 lbs.
No. 5* . . . for coils up to 600 lbs.
No. 10* . . . for coils up to 1,000 lbs.
No. 25* . . . for coils up to 2,500 lbs.
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ACME training has been fully proved in practice, through its fine resident schools, and is endorsed by industry. Hundreds of graduates are employed as designers, checkers, process engineers, chief engineers. ACME training takes a fraction of the time required by apprenticeship . . . qualifies you in less than a year for a lucrative position. Individual training permits enrollment at any time, in day or evening classes. G. I. approved. Correspondence courses available. WRITE TODAY!

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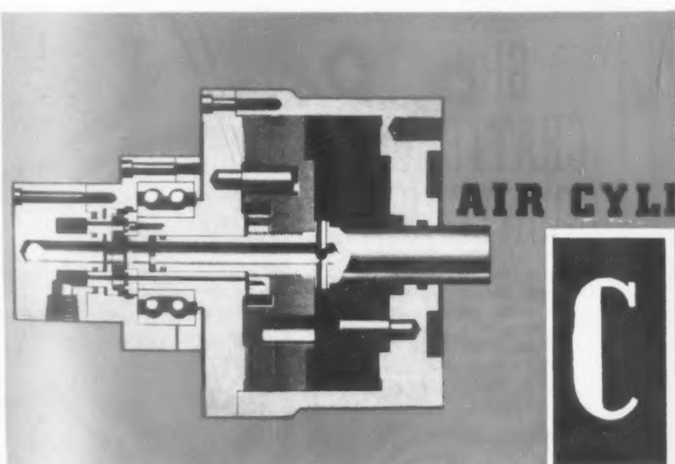

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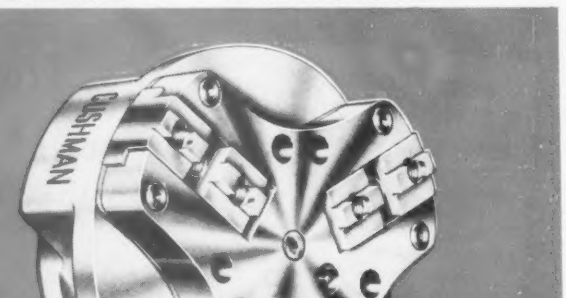

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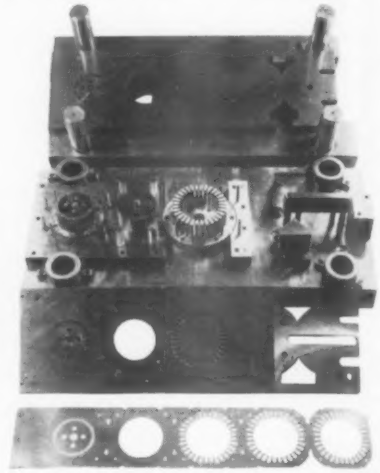

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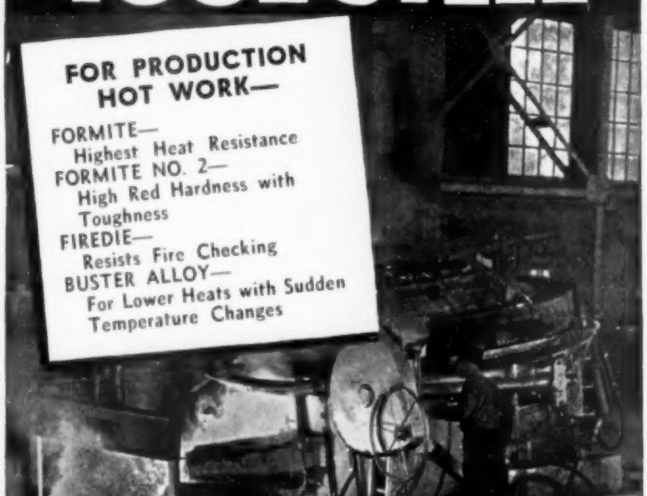

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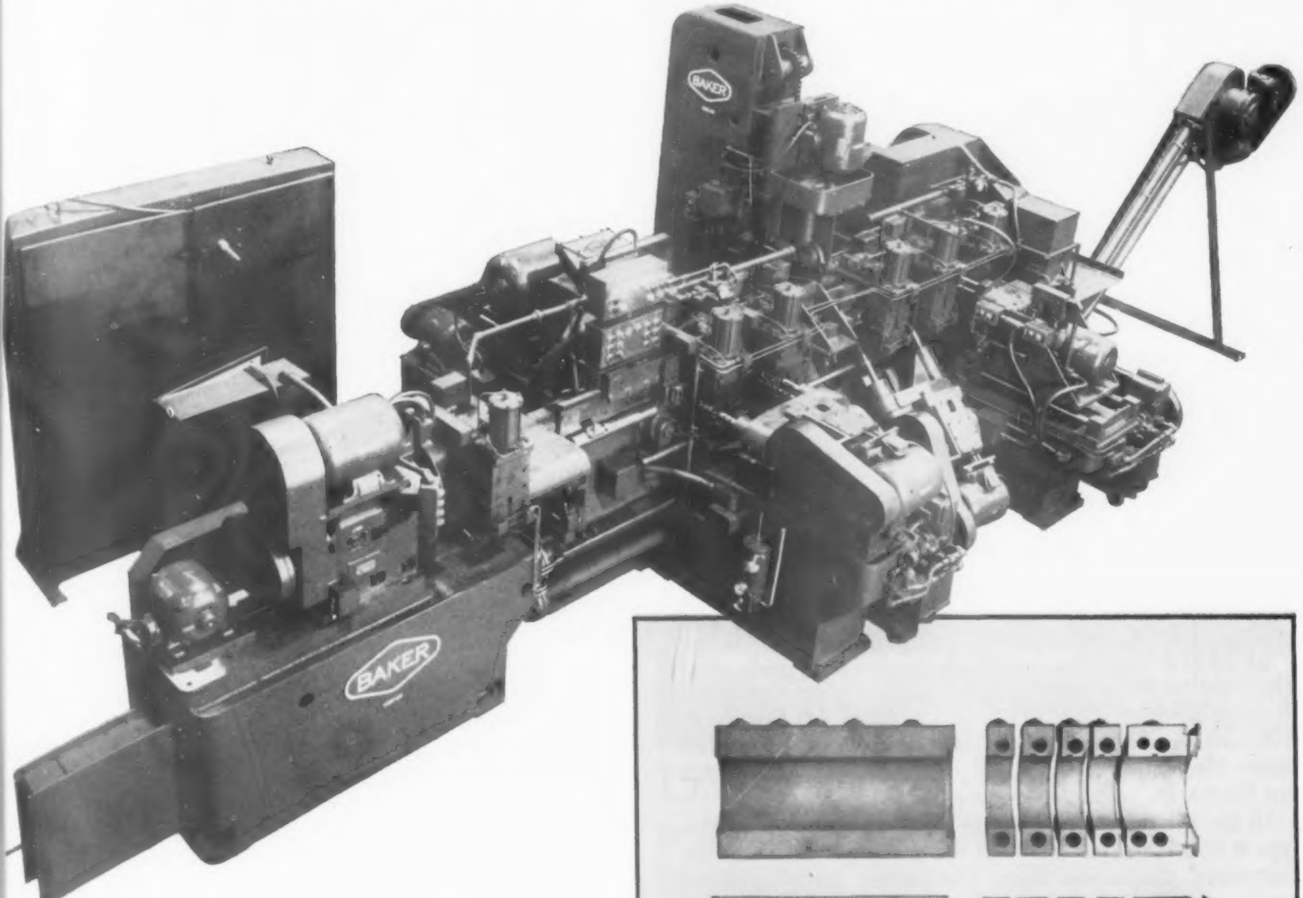

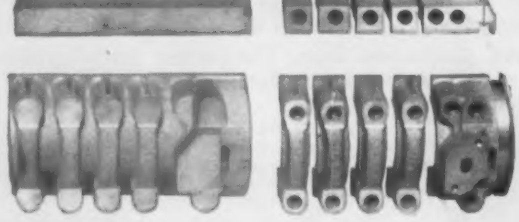

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JANUARY, 1951

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Above: Counterboring a hole in a cast iron machine base. Uniformity of chips indicates free-cutting action; chip disposal is aided by wide flutes. And when the operation is finished the cutter is removed from the holder with a simple *twist of the wrist.*

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